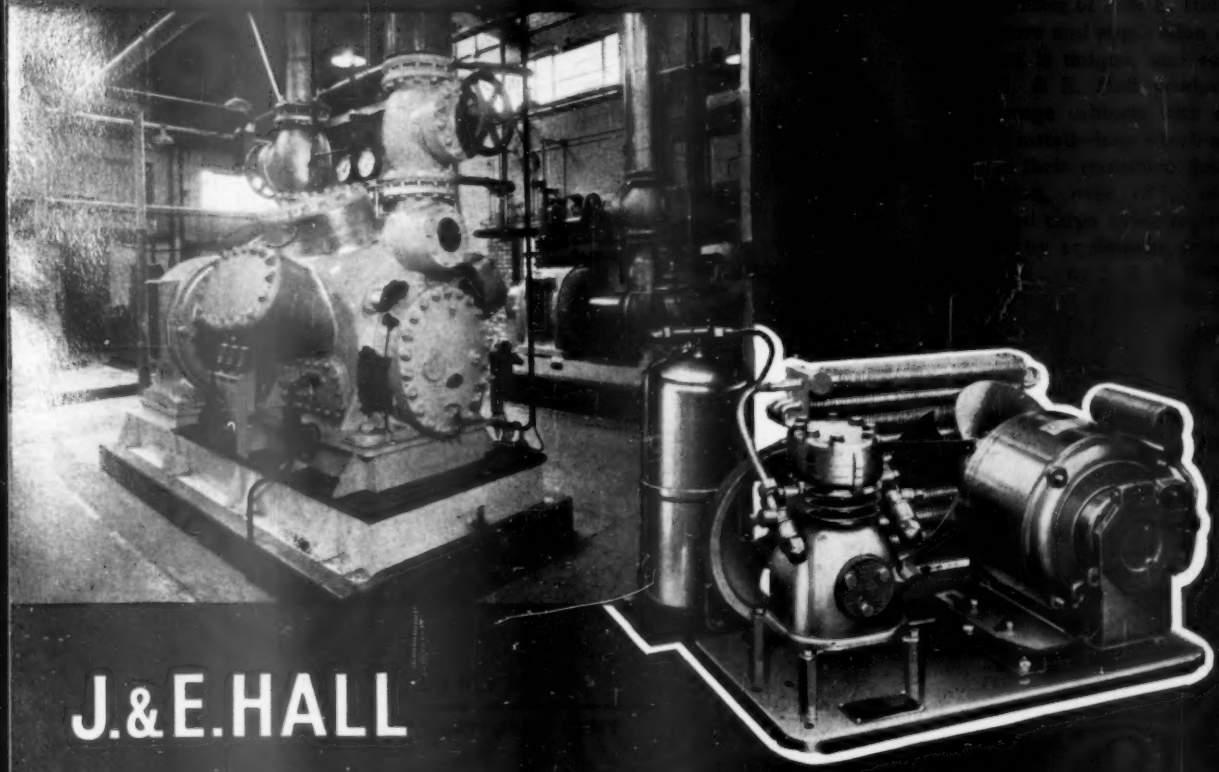
Modern Refrigeration & Air Control

Vol. 63 No. 742 JANUARY, 1960 Price 2s. 6d. monthly

Refrigeration Equipment



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REFRIGERATION FITTINGS—

angle valves dehydrators receivers unions
compressor valves filters sight glasses
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heat-X inner-fin* range

stand 46 REFRIGERATION EXHIBITION

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Teddington THINLINE

KCA Thermostat

It's the most compact, reliable and accurate refrigerator thermostat ever produced. Suitable for Absorption or Compressor type Domestic Refrigerators, the new Thinline Thermostat utilizes a well-tried seamless metallic bellows in conjunction with a heavy duty blade spring for supreme reliability. All stresses from working components are supported by a main frame of stainless metal. The switch mechanism embodies solid silver contacts especially arranged to prevent moisture accumulation between live parts. Fully corrosion resistant construction. Instruments aged under tropical conditions to ensure permanent stability anywhere in the world.

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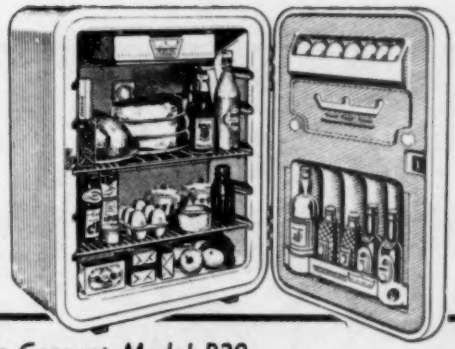
TR.71

WITH THE NEW 1960 RANGE AND PRICES

Leconomy gives even more value for money (and that means more sales!)



—Here is the new range of **Lec** *Refrigerators.*
—They offer all the luxury features carried by the more expensive models:

★ greatest capacity in smallest floor area
★ superb engineering and streamlined design
★ beautiful cabinet finished in gleaming Dulux stove enamel covered by a guarantee for one year
★ The Lec 'Vertimetic' hermetically sealed power unit covered by five year guarantee.

Here is luxury refrigeration at lowest ever cost—unchallenged value for money

The Lec Coronet Model P20

NEW FEATURES

Door liner with—moulded egg rack—moulded butter compartment—freezer door. Capacity: 2 cu. ft. Shelf area: 3.6 sq. ft. In White or Cream. External Dimensions: 27½" high, 21½" wide, 20½" deep. Optional extras: Contemporary steel stand with rubber feet — price 38/4

NEW PRICE 39 GNS

The Lec Continental Model P86

NEW FEATURES

Door with—attractive 'gold' 'Continental' motif—'gold' 'Lec' motif—'gold' handle. Interior with—'gold' shelf and drawer cappings—'gold' door shelf rails—new contemporary style combined light-housing and thermostat knob. Capacity: 8 cu. ft. Shelf area: 14.5 sq. ft. In White or Cream. External dimensions: 57½" high, 26½" wide, 27½" deep. Giant freezer with plastic door holds 1,315 cu. ins. of frozen food.

NEW PRICE 99 GNS

The Lec International Model P60

NEW FEATURES

Door with—new smart 'square look'—new horizontal handle with push-pull action—attractive 'International' motif. Door liner with—moulded egg rack—moulded bottle rack—giant size door compartment for butter, fats, cheese, etc. Kick plate—in rigid polythene. Freezer door—in modern styling. Capacity: 6.2 cu. ft. Shelf area: 10.7 sq. ft. External dimensions: 44" high, 23½" wide, 26½" deep. In White or Cream.

NEW PRICE 69 GNS

Lec

Full range of our products can be seen at our London Showrooms—217 Regent Street, W.1. Tel REG. 6607.

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To Lec Refrigeration Ltd., Bognor Regis, Sussex

Please send illustrated details of the **Lec** Refrigeration range.

NAME_____

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MR15

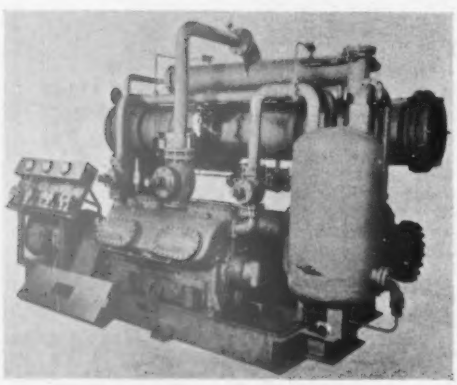
THIS SHRINKING WORLD

and

an **EXPANDING** organisation

Each day communications **improve** and effect a diminution of earth's diameter. Each day **increases** man's knowledge and experience. Each day, logically, man **requires** the fruits of his gain.

For over 10 years Alfred Porter & Company have made refrigeration plant—its associated Companies for **almost a century.** The knowledge and experience thus gained is in the **Refrigerating Plant** now produced by this **expanding organisation** and available to you and your clients.



Here illustrated is a 100 TR Water Chilling Plant. It is **factory built as a packaged unit.** It requires just 12' 6" long by 6' 0" wide by 8' 3" high to house it.

The Compressor has 12 cylinders, INBUILT CAPACITY CONTROL, BALANCED MOTION WORK and is precision built.

The Condenser and Evaporator have MAXIMUM HEAT EXCHANGE SURFACE in the smallest possible dimensions.

Control is reduced to SIMPLEST possible terms, yet with every PROTECTION device.

IT'S A FIRST CLASS PIECE OF APPARATUS

Further particulars from Department B—

ALFRED PORTER & CO. LTD.

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For this fine, up-to-date new store in Britain's most modern shopping centre . . .

. . . MAYPOLE CHOOSE FRIGIDAIRE REFRIGERATION—NATURALLY

Of course they choose Frigidaire! For this fine new store in Britain's first all-pedestrian shopping centre at Stevenage, Maypole wanted the very finest refrigeration equipment they could get.

Elegant and colourful sales cases. The Frigidaire Manhattan sales cases Maypole had installed are not only technically superb. They are extremely attractive in appearance. Manhattan cases are available in a big range of colours too, so it's easy to match up with your colour scheme.

This is what Maypole chose : one 18′ run of pale blue Frigidaire Manhattan Cases for dairy produce and sausages. One 18′ run of chilled shelf displays for cheese, fats, etc. One 18′ run of sea-green open top cases for meat display, with refrigerated storage at the back. And a 6′ Manhattan Minor display case for frozen foods.

Frigidaire cold rooms. Frigidaire also installed two cold rooms. One, 100 cu. ft., for provisions. The other, 500 cu. ft. and fitted with electrical defrosting equipment, for storage of prepared meat. A Frigidaire Conservator provides additional zero storage space.

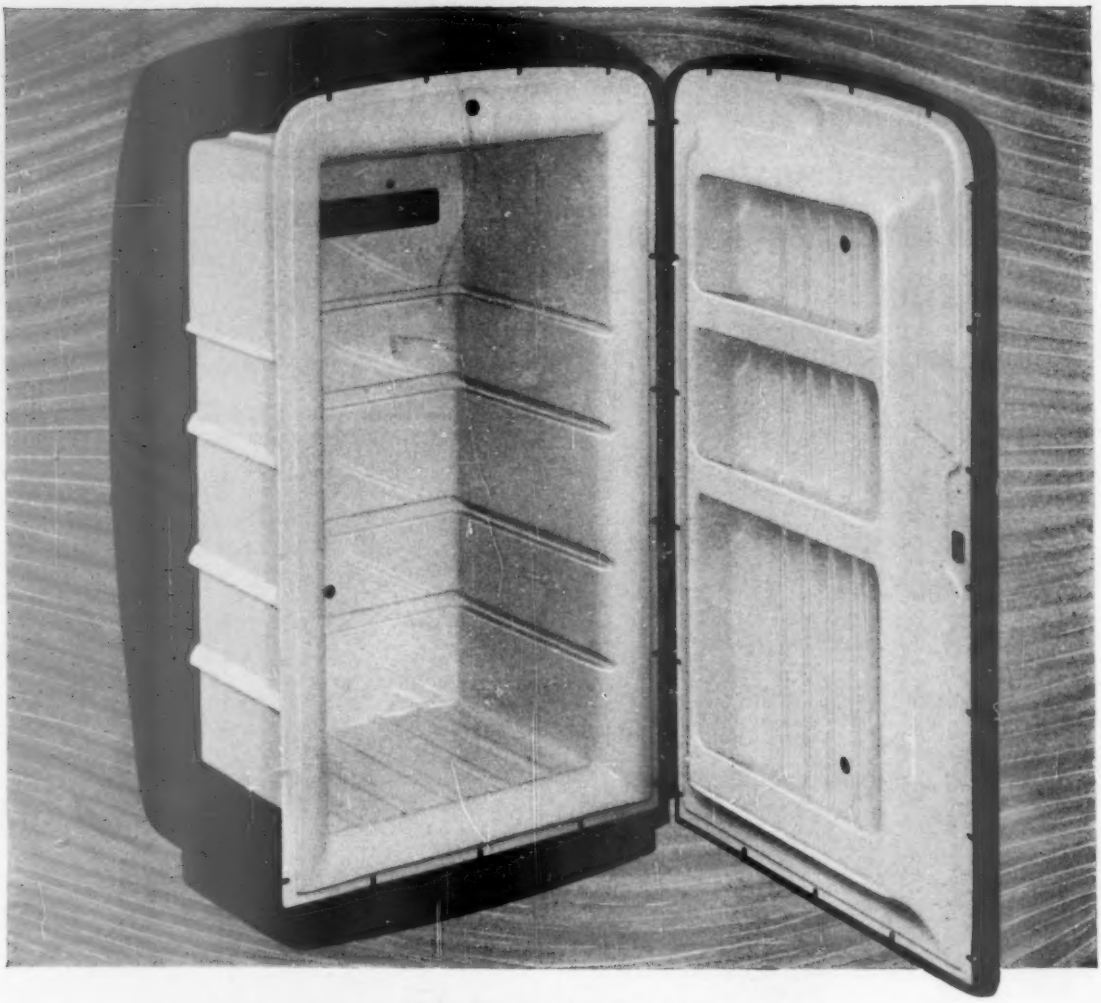
How about you? Have you a refrigeration problem? Then let Frigidaire help you. It doesn't matter whether it's a big job or small. Frigidaire can handle it. Write for further details or call your Frigidaire Distributor today.

FRIGIDAIRE

Regd. T.M.

means business—for you!

FRIGIDAIRE DIVISION OF GENERAL MOTORS LTD., STAG LANE, KINGSBURY, LONDON, N.W.9



Streamlined linings

Refrigerator inner and door lining by Thermoplastics Ltd Dunstable

This complete inner and the door lining for the Astral refrigerator are vacuum-formed, in Bextrene toughened polystyrene sheet.

This is extruded from granules of BEXTRENE BC15 high impact polystyrene — more than four times as tough as general purpose polystyrene. It is ideally suited for thermo-forming either by draw-forming or vacuum-forming or by a combination of these processes. Owing to the high yield, Bextrene Sheet is a most economical material to use. Its specific gravity is approximately 1.06

Bextrene's toughness, dimensional stability and chemical resistance make it a first class material for all types of semi-rigid packaging containers; display materials; component parts for radio and television sets; toys and decorative novelties.

BEXTRENE Sheet

Please write for technical data sheets on Bextrene sheet and Bextrene moulding powders.

BX PLASTICS LIMITED *A subsidiary of The British Xylonite Co Ltd*

Cobex and Bextrene Sheet Sales Division, Manningtree, Essex
Telephone : Manningtree 401

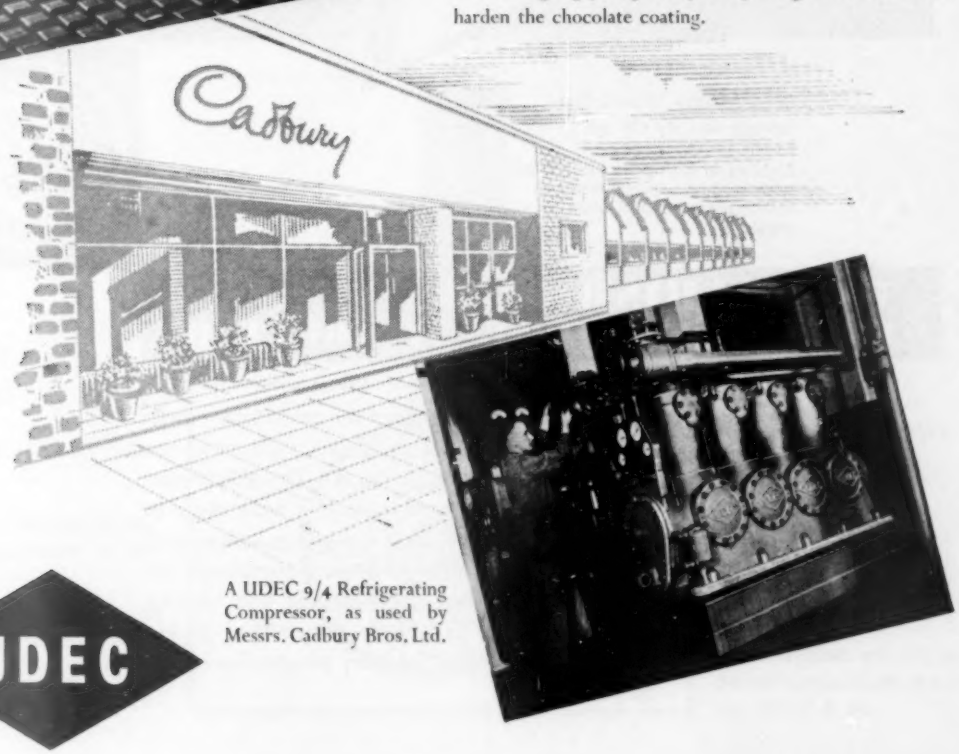
TA 2075

Refrigeration in industry

No.6

BISCUIT MANUFACTURE

The Cadbury Bros. Ltd., Moreton Factory in the Wirral, Cheshire, was originally opened in 1954. Since that date, major extensions have been added and it is today the most modern chocolate biscuit factory in Europe. New UDEC refrigeration equipment, with a capacity for extracting 3,000,000 B.T.U.'s per hour, with extension to 4,000,000 B.T.U.'s per hour with brine at 5°F., has now been installed, and this supplements the UDEC equipment which, for some years, has been providing the refrigeration for the manufacture of chocolate biscuits. After the biscuits have been drawn through a curtain of liquid chocolate on an endless moving belt, they then travel under a zig-zag passage of specially designed coolers which harden the chocolate coating.



A UDEC 9/4 Refrigerating Compressor, as used by Messrs. Cadbury Bros. Ltd.

UDEC

U. D. ENGINEERING COMPANY LIMITED

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UDE 10R

Produce ticket strip

Formica top with aluminium beaded edge

Embossed evaporator divider plates

Stainless steel defrosting capping

Quadruple glass, clear vision display window

High gloss, hard baked, stove enamel finished with aluminium decorated beading

Gross capacity 15 cubic feet.
Storage capacity 450 lbs. frozen foods.
Finished in high gloss stove enamel with Formica serving shelf and colour mounted aluminium beading.

JS WHITE

THE 'CARISBROOKE' FROZEN FOOD DISPLAY COUNTER

The ever-increasing demand for quick-frozen foods has prompted the design of this addition to our range of refrigeration products. The glazed window unit permits the display of a wide range of frozen produce, the open top giving unrestricted customer accessibility without disturbing the display. Attractive in appearance and efficient in operation, the Carisbrooke frozen-food display counter is a M-U-S-T for every progressive vendor of frozen foods.

J. SAMUEL WHITE & CO. LTD.

REFRIGERATION DIVISION

WORKS AND SALES
Somerton Works, Cowes, Isle of Wight. Tel: Cowes 400

LONDON OFFICE
3 Duncannon Street, London, W.C.2. Tel: Trafalgar 8064

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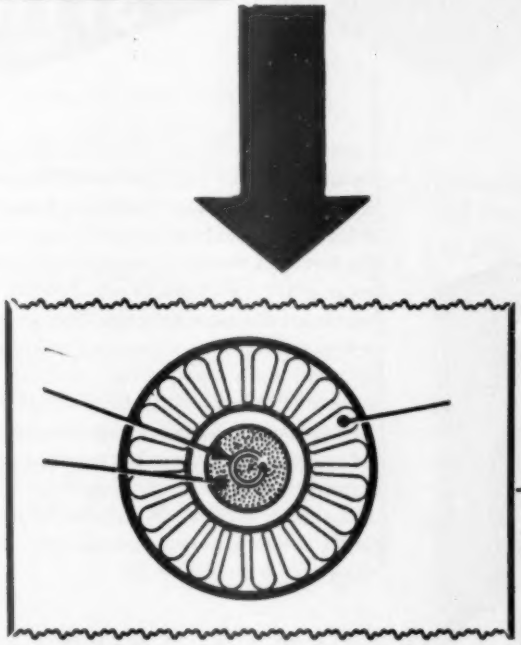
SEARLE BUSH

Automatic Electric Defrost Coolers have that others have not?

This is it!



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HEAT APPLIED IN THE RIGHT PLACE— THE INSIDE OF THE EVAPORATOR TUBE

REFRIGERANT FLOWS THROUGH INNER FINNING BETWEEN THE INNER AND OUTER TUBES

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8 STANDARD MODELS FROM 2,500—24,000 B.t.u's/hr. AT 10° F. Fd.

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of 11,000,000

11,000,000 reasons for STYRON Polystyrene

At least eleven million homes in Britain have no refrigerator. Versatile Styron* Polystyrene will help you sell in this profitable market, wide open to products efficiently designed and economically produced. The Prestcold Packaway, winner of the Duke of Edinburgh's design award, and chosen as one of the Top Sixteen designs of 1959, makes good use of Styron's unique qualities in strong, easy to clean, space and weight saving doors and cabinet liners. Tough, resilient, colour-fast Styron easily and accurately reproduces the finest detail, the most complex design— and retains its full strength at low temperatures. Styron brings a new design freedom and unlimited colour choice to the whole range of refrigerator components. *For full information about Styron polystyrene please write for Booklet No. 211.*

* *trade mark of Dow Chemical Company USA manufactured by Distrene Limited*

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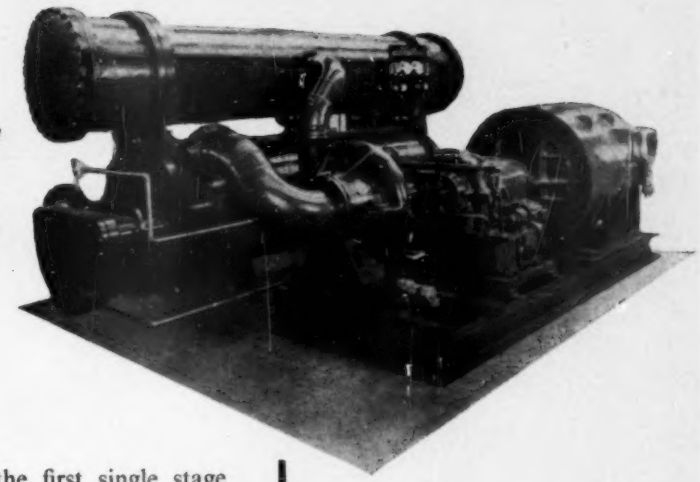
TURBO SET FOR AHMADI HOSPITAL KUWAIT—

and another first for YORK



What are believed to be the first single stage turbo compressor water chilling systems to be exported from Great Britain to the Middle East left recently for Kuwait Oil Company's new hospital.

Two entirely self-contained turbo packaged water cooling systems were designed, with special consideration given to the problems arising from insufficient fresh water supplies and the necessity of using sea water for cooling. Each system is rated to cool 875 gallons per minute, which represents a heat removal rate of 4.2 million B.Th.U's per hour.

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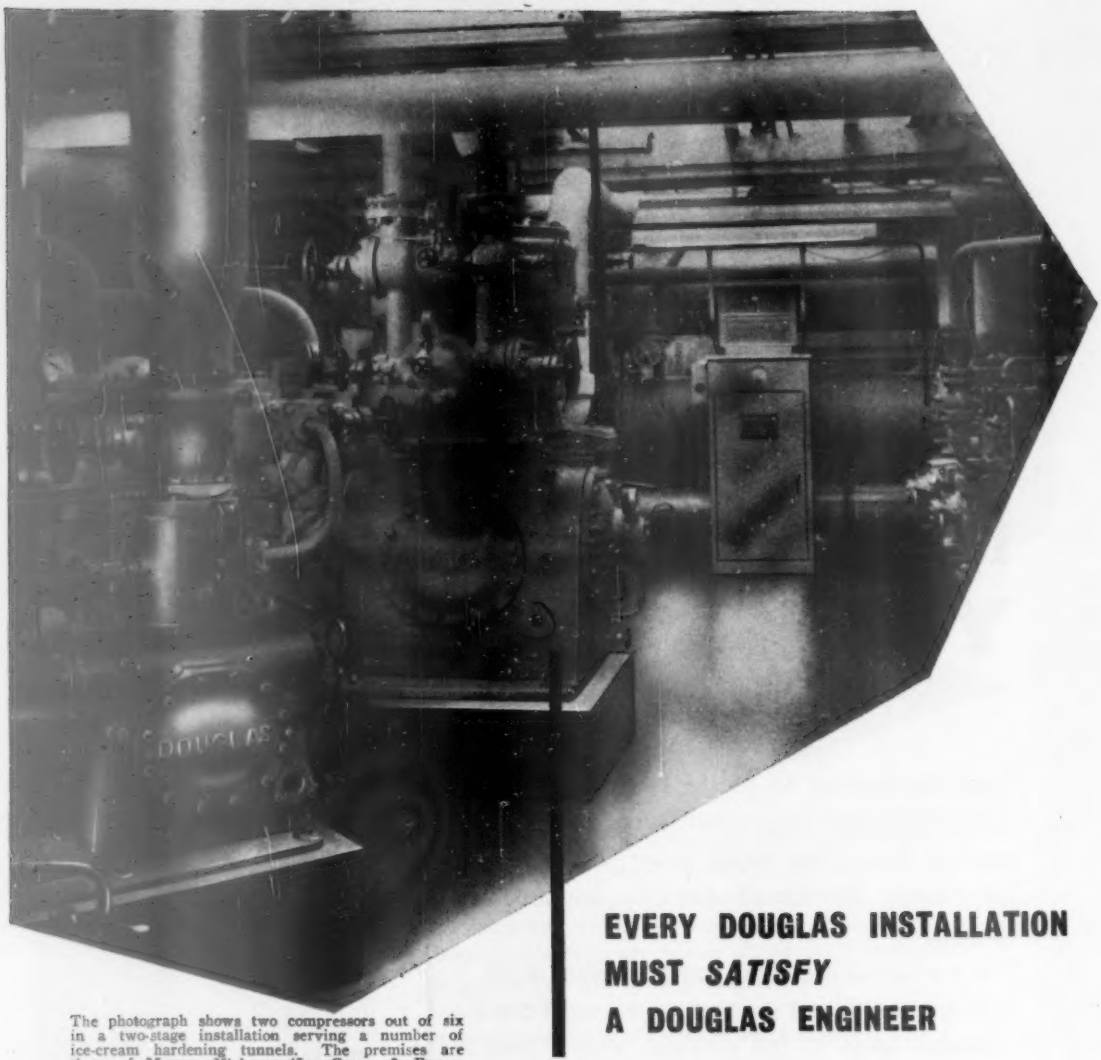


The photograph shows two compressors out of six in a two-stage installation serving a number of ice-cream hardening tunnels. The premises are those of Messrs. Nielsons (Ice Cream & Frozen Foods) Ltd., by whose courtesy this photograph is reproduced.

OTHER DOUGLAS EQUIPMENT COMPRISES:

CONDENSERS shell and tube, or evaporative.
INTERCOOLERS
LIQUID AMMONIA PUMPS
EVAPORATORS Plain pipe, finned pipe, shell and tube, submerged type, flooded, etc.
INSULATION and COLD ROOM DOORS for all cold storage and low temperature applications.

DOUGLAS

EVERY DOUGLAS INSTALLATION MUST *SATISFY* A DOUGLAS ENGINEER

Reputation, not immensity, has been the foundation of Douglas growth, and every growing reputation depends upon reliability and experience. No less this one. That is why the most thorough care is taken with each installation—to ensure that everything is in perfect order.

Douglas experience, combined with personal service, is appreciated by a considerable number of users. Douglas can probably assist you. Why not think about it?

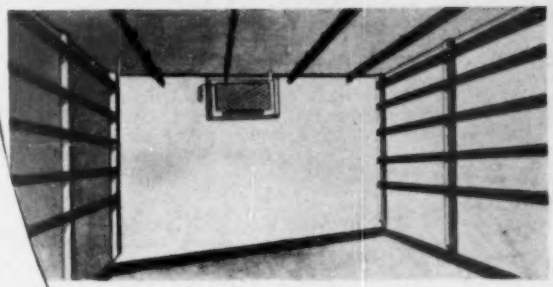
WILLIAM DOUGLAS & SONS LIMITED, DOUGLAS WHARF, LONDON S.W.15. — Telephone: PUTney 8181

A cold room - refrigeration plant

at low or medium temperatures—

for a cost of only

£180



TEMKON

PACKAGED UNITS

suitable for Cold Stores in **HOTELS, SHOPS, CATERING ESTABLISHMENTS, SUPERMARKETS, ETC.**

- Packaged units for static and mobile applications.
- Low temperature range:— −15° F to +38° F.
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- Hermetically sealed units, refrigerant-charged for life.
- Air or water cooled, single or three-phase electrical supply, at option.

Foodstuffs and perishables are safeguarded by Temkon Units which maintain an even flow of refrigerated air throughout the cold-store room. They are completely self-contained and delivered factory piped for easy, low-cost installation. Supplied with installation kit.

Write for full details to

TEMPERATURE LIMITED

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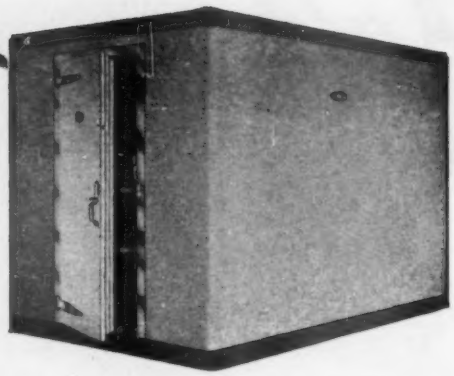
LARGEST PRODUCER OF PACKAGED AIR COOLING PLANTS OUTSIDE THE U.S.A.

P.3873

*The economical method of MODERN STORAGE

Whatever you pay for your refrigeration plant, it is so much money wasted unless it is absolutely reliable at all times.
FROZT-ED-AER equipment is both reliable and economical. There is a wide range of refrigerators for storage and display [or storage, display and deep freeze cabinets] at reasonable prices. Please write stating your business.

FROZT-ED-AER
Automatic
REFRIGERATION



500 cu. ft. Coldroom. All-white coach-built finish.
Applications for agencies invited.

FROZT - ED - AER, REFRIGERATORS
REDDISH STOCKPORT
(The Crowthorn Engineering Co. Ltd.)

Phone :
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Grams :
"Crowtool," Reddish

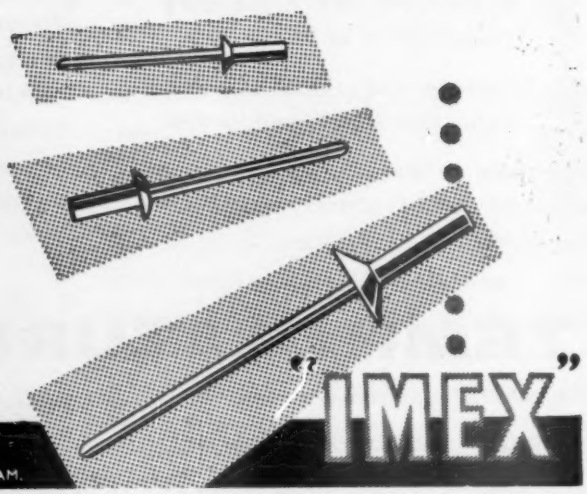
CR. 353

A NEW BLIND RIVET
WHICH IS WATERTIGHT

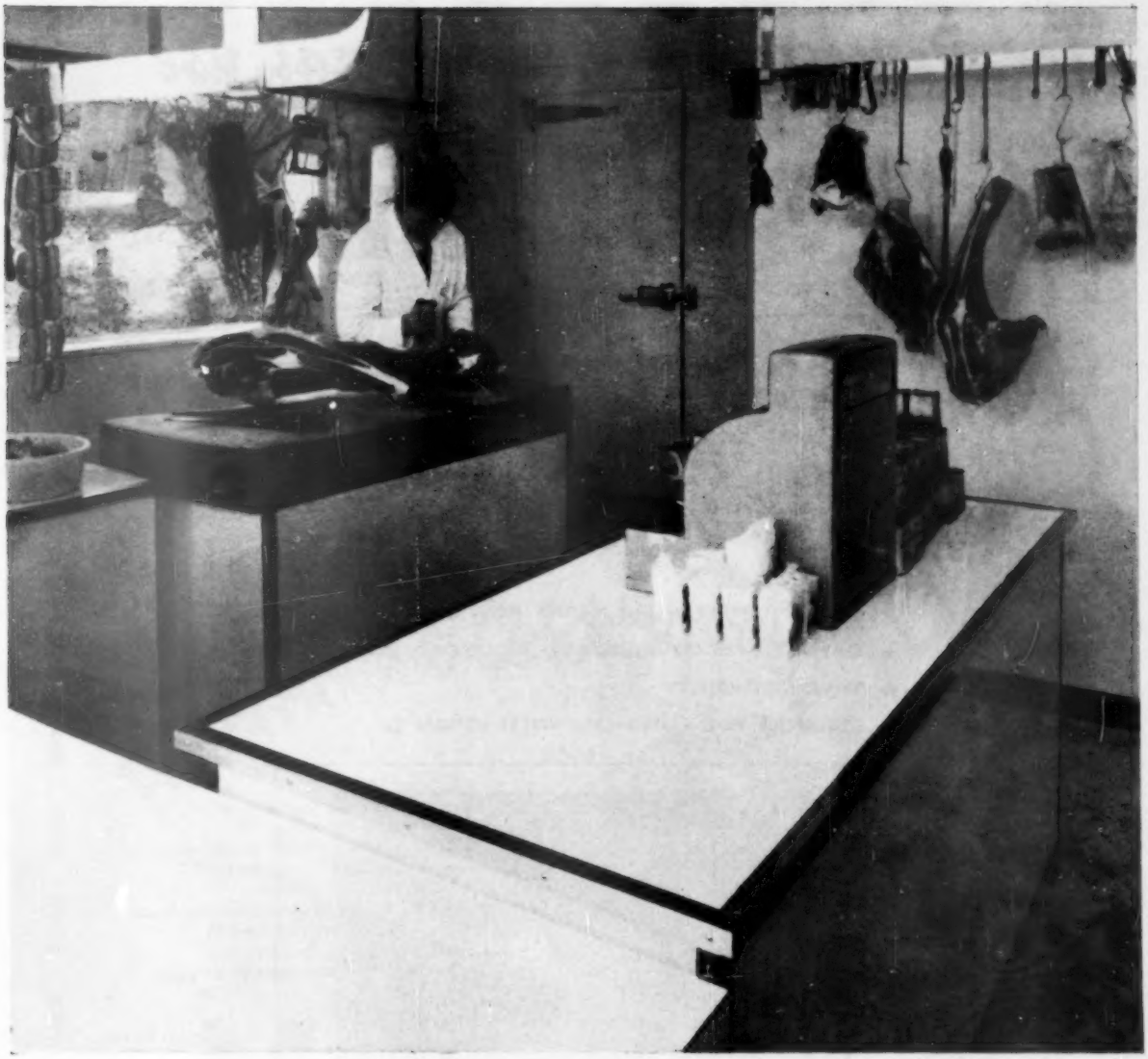
Announcing the new **"IMEX" rivet**

Incorporating all the existing advantages of the well-known "Pop" Rivet, the "Imex" Rivet offers tremendous new advantages in assemblies where a gas- or water-tight joint is essential.
The "Imex" Rivet is now available in a limited range of sizes, including 1/8", 5/32" and 3/16" dia. It can be supplied on two alternative mandrels which only break after the rivet is fully set. The short break mandrel fractures immediately under the head, which is thus retained within the set rivet. The long break mandrel fractures outside the rivet and its protruding part can be subsequently trimmed to give an entirely flush finish and a solid steel core to the rivet.
Write us now for more detailed information.

The trade mark "IMEX" is registered in respect of rivets in the United Kingdom and many other countries in the name of the Geo. Tucker Eyelet Co. Ltd.



GEO. TUCKER EYELET Co. Ltd.
Walsall Road · BIRMINGHAM 22.
Telephone: BIRchfields 4811 Telegrams: EYELETS B'HAM.



George Mixer and Co. Ltd., Norwich, carried out the 'Darvic' p.v.c. sheet installation in the shop of W. Stratton, Salhouse.

Modern Butchers' shops use clean, hygienic 'Darvic'

There is a lot of 'Darvic' p.v.c. sheet in this butcher's shop. The top and sides of the counter, the sides of the wooden topped meat chopping counter, and the door and wall of the cold room are covered with this hygienic I.C.I. material. 'Darvic' panelling means that customers are attracted by a clean shop which can easily be maintained in good clean condition.

'Darvic' is an hygienic and odourless material that will not taint food. It is tough yet light and is rigid even in thin sheets. 'Darvic' has low thermal conductivity, has high impact strength and resists corrosion. 'Darvic' is easily heat shaped and is available in a wide range of attractive colours.

'DARVIC'

'Darvic' is the registered trade mark for the rigid p.v.c. sheet made by I.C.I.

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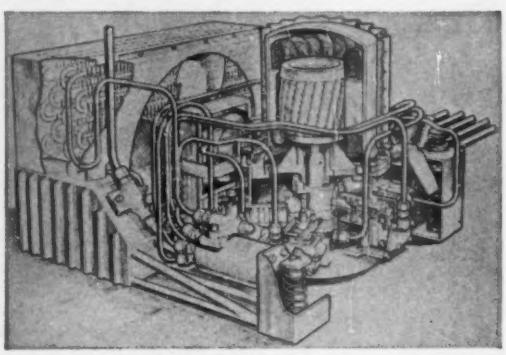
PD.69

for Domestic or Commercial use

Sylvian
(REG'D)

A universal Serviceable *Sealed Unit with* UNIQUE *features*

- ★ LOWER TEMPERATURE MEANS REAL DEEP-FREEZE
- ★ OBVIATES PRE-COOLING AND SECONDARY CIRCUITS
- ★ WIDE VERSATILITY
- ★ DESIGNED FOR LONG LIFE WITH FREON 22



British Patent
UK 680922

Australian Patent
154195

U.S.A. Patent
2738122

New Zealand Patent
105246

While having the advantages of effective "Sealing" this Unit offers every facility for complete testing, maintenance or repair on the spot by ordinary Service Engineers using simple tools. Costly periods of enforced idleness are thus avoided. A special feature of the design is the interlock of main casings, giving exceptional rigidity, and long, trouble-free life. Readily adaptable to a wide variety of mountings it provides an efficient component, as original or replacement, over a large field of operation.

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The " **MINIVEIL** " air curtain permits the cold store door to remain open for prolonged periods, giving completely free passage for men and goods, with a negligible rise in store temperature. No longer need you bother about the constant opening and closing of coldroom doors or the proper operating of air locks by the coldroom staff. You can rely on the protection afforded by the curtain of air provided by a " **MINIVEIL** " unit.

MINIVEIL

AIR CURTAIN UNIT

FOR OPEN COLD STORE DOORS

For efficient Cold Storage operation

The Minikay System keeps new insulation permanently dry and dries out existing wet insulation.

The Minikay System eliminates the heavy cost of re-insulation.

The Minikay System extends the life of your cold store to that of normal buildings.

Cold Storage insulation is extremely valuable—protect it with Minikay.

MINIKAY

DEHYDRATION

FOR PERMANENTLY DRY INSULATION

MINIKAY LIMITED

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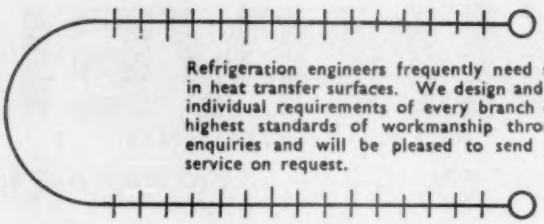
We shall be pleased to see you at Stand No. 13 at the Industrial and Commercial Refrigeration Exhibition, Royal Horticultural Hall, Feb. 15-17.

a specialised service in

heat transfer surfaces



Refrigeration engineers frequently need more than a standard service in heat transfer surfaces. We design and supply this equipment to the individual requirements of every branch of industry, and maintain the highest standards of workmanship throughout. We welcome your enquiries and will be pleased to send details of our products and service on request.

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HERMETIC COMPRESSORS
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HERMETICALLY SEALED

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1/15 through 1 HP
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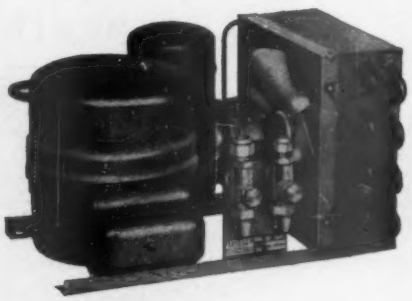

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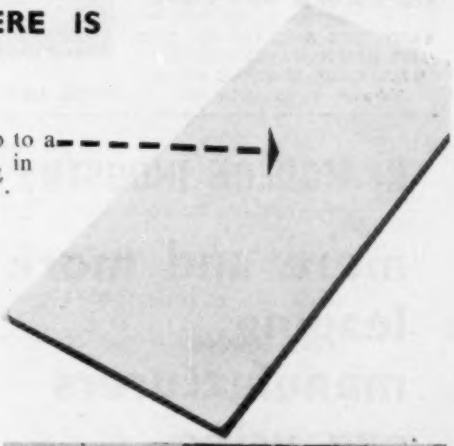

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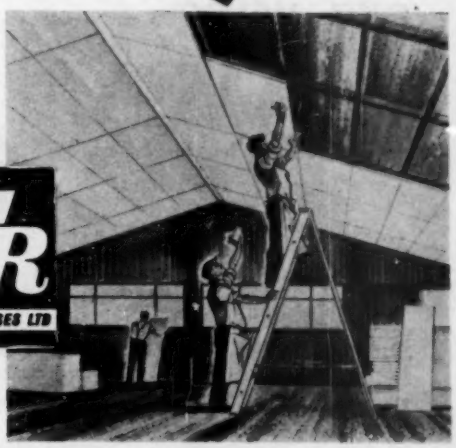

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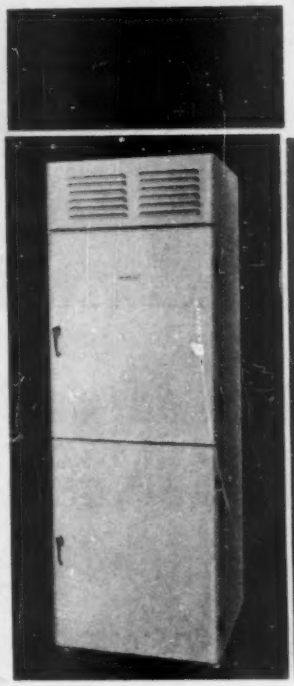

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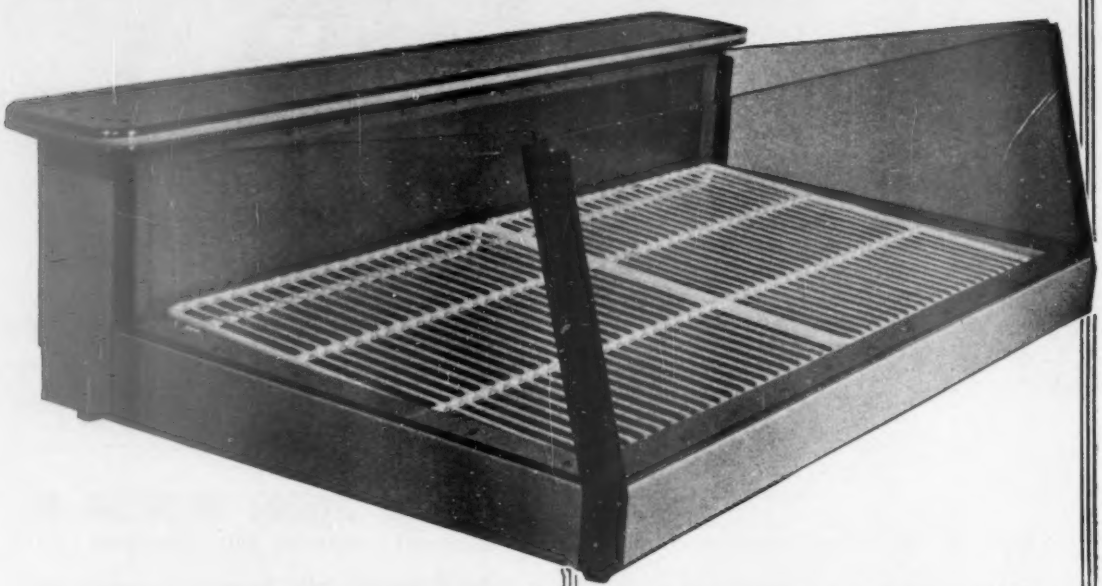

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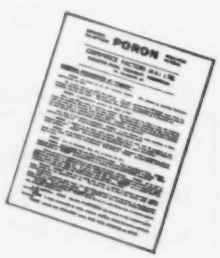

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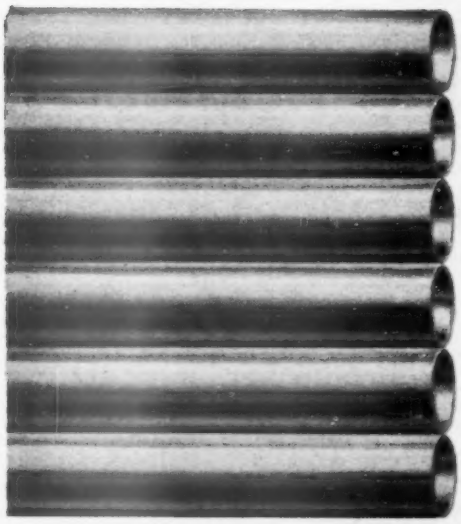

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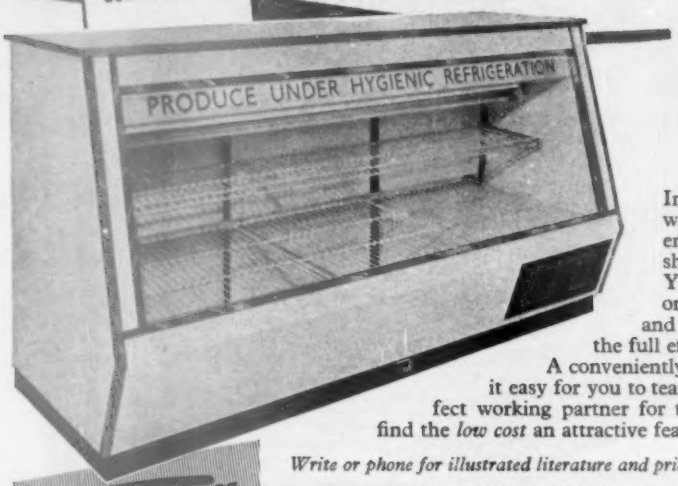

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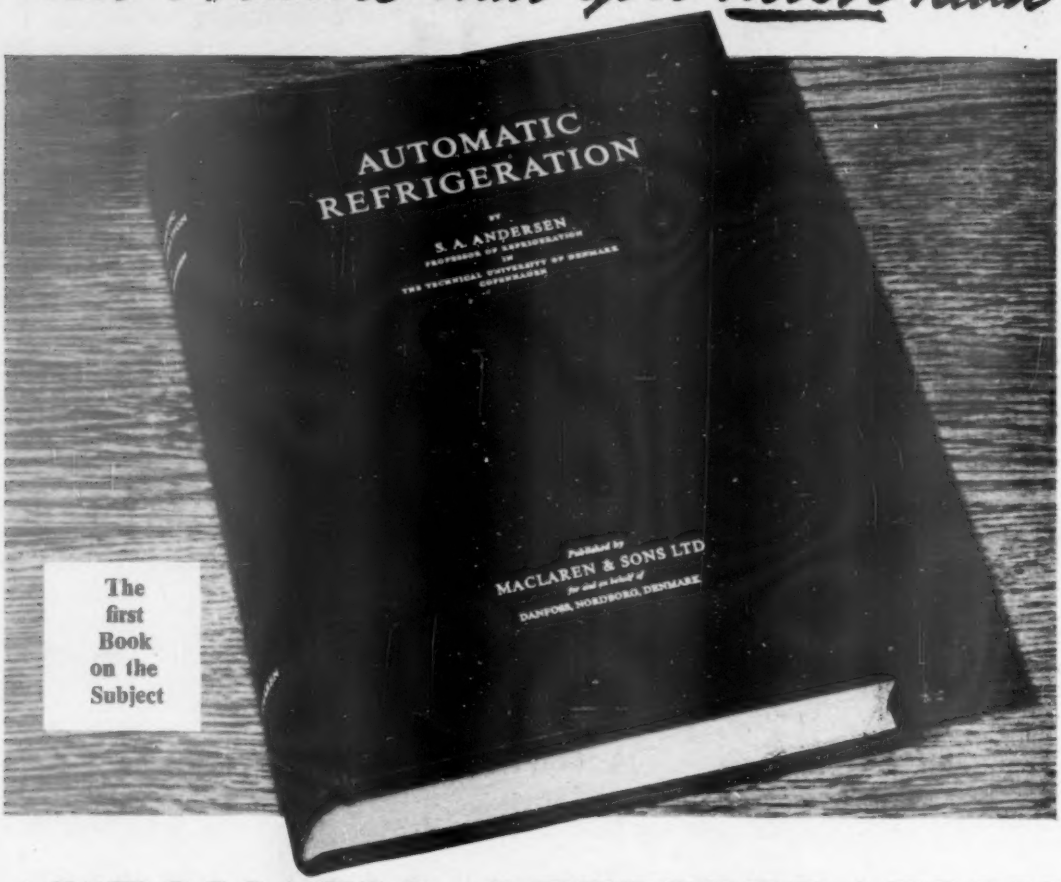

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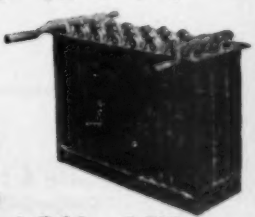

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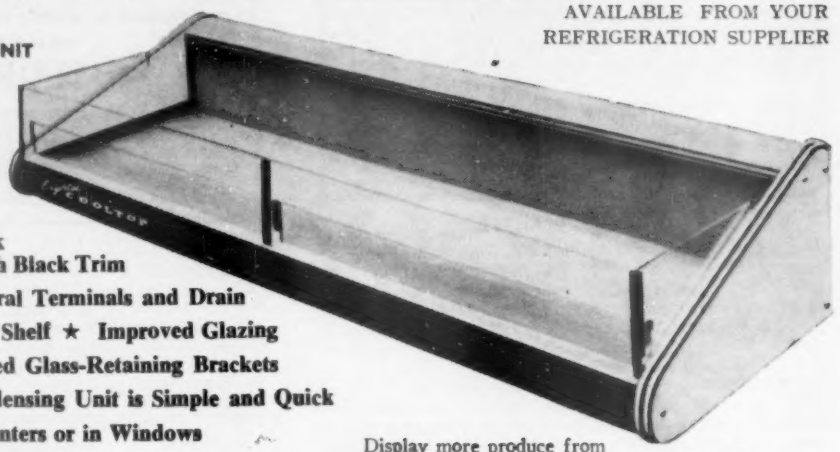

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JANUARY · 1960

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MODERN REFRIGERATION *Overseas*

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By post 3s.
Subscription: £1 15s. per annum. incuding postage.

Editor-in-Chief:
THEODORE A. RAYMOND

Advertisement Manager:
J. A. Hutchinson

REFRIGERATION PRESS LIMITED
MACLAREN HOUSE, 131 GT. SUFFOLK ST., LONDON, S.E.1
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Editorial . . . .

The 1959 Cold Year

Shrinkage and the Butcher

Keeping Foods Fresh

● An outstanding feature of the 1959 refrigeration year was surely the impact which the frozen food producers and retailers made on our industry, resulting in the erection of dozens of low temperature stores and the installation of thousands of shop display cases ; the total of these cabinets now stands at 64,000, it is reliably estimated.

● The food quick-freezers, living up to their name, usually do things in a hurry and expect buildings to be run up at high speed. In most instances, they have not been disappointed. Typical of these hustling requirements was the constructional schedule set for the £250,000 cold store at Kirkby, Liverpool, which measures 300 ft. long by 110 ft. wide, externally, excluding airlocks and loading bank, and illustrated on another page in this issue. Work of erection of the steelwork began on April 10 and the store was ready for occupancy at—5° F. on July 31, a fine performance that was not without parallels in many quarters of the country last year.

● If 1959 was a year in which quick-frozen food installations dominated the market (along with, of course, domestic refrigeration) we believe that 1960 will see a tremendous development in refrigerated transport which is perhaps a natural sequel to last year's activity already mentioned. For this reason we put the accent on this aspect of refrigeration in this new year issue. Many authorities dismiss the need for cooling facilities aboard food vehicles in this tiny isle but traffic congestion makes this requirement more urgent than ever.

● At the December meeting of the Institute of Refrigeration problems in the retail meat trade came under review. Why, asked one speaker, is the butcher so critical of loss of weight in storage when his customers produce the most devastating losses in weight in the kitchen without regretting the result. Surely with a standard type and usage of cold room the loss of weight could be standardized and allowed for. Lack of progress in cold room construction was alleged by another who advocated removal of the entering heat between the insulation and the inner skin to minimize heat interchange and air movement in the storage space. This envelope type of cold room construction was described in these columns no less than 30 years ago ; in the meantime, many millions in butchers' profits may have been sacrified by preventable loss of weight. The temperature of the meat entering the cold room from the supply vehicle often shows up a weakness in the cold chain. Ideal conditions in various stages from abattoir to butcher's shop can be negatived by archaic types of vehicles which, unfortunately, can still be seen supplying meat to many butchers' shops. If the meat condition is kept static throughout the cold chain and externally cooled cold room walls are employed, the loss of weight due to humidity would vanish.

● Following our description last month of refrigeration plant for dam construction comes the news of a man-made "deep-freeze" some three storey levels beneath Dorchester Street, Montreal, which has been created to "anaesthetize" thousands of tons of rock, earth and water. Locale of this unique, but remarkably effective, system is the site of the new multi-million dollar Hydro-Quebec substation and office. Owner and operator of the below-ground ice box is Parco Drilling and Exploration Co., Ltd., near neighbours of J. & E. Hall's office in Montreal, whose engineers recommended the new system to overcome what was termed hazardous soil conditions in the area and to prevent the possible shifting of nearby buildings and water infiltration.

● The novel method of freezing the soil along a 1,200-ft. perimeter was evolved following exploratory borings which indicated that extra measures were called for on the site if the excavations were to be done with safety and dispatch. To augment the 379 20-in. reinforced steel concrete filled piles that form the first line of defence, Parco engineers decided on the deep-freeze system that effectively formed a solid 30-in. earth wall perpendicular to the area that was to be excavated. In design, this freezing process resembles an artificial ice rink except that it is perpendicular rather than on a horizontal plane. The actual pipe inserts which create the buffer earth barrier are 2½-in. in diameter. Excavation would have been dangerous without the ice buffer.

● Through extensive research, Philco's Advanced Development Laboratories have established the following as the most favourable conditions for the preservation of fresh foods : Threshold of freezing ; maximum humidity ; still air. Once these conditions had been established, it became the task of the refrigeration design engineers to translate them into reality in a practical refrigerator compartment. The conditions maintained in the "Air Wrap" compartment of their latest refrigerators are similar to those which would exist in the centre of a large, hollowed-out cake of ice. If fresh food could be stored in the interior of this cake of ice, the conditions established by the food technologist would be present, for the following reasons : This specification contains three basic parts : heat blockage, heat removal and temperature control. All three are needed to obtain threshold of freezing conditions for fresh foods. The hollow cake of ice locks out any external heat with its walls of ice. The inherent latent properties of melting ice provide the necessary heat removal. Finally, there is nothing more accurate in establishing 32° F. than melting ice. The hollow cake of ice provides for maximum humidity as follows : The walls of ice themselves provide the mechanical barrier necessary to create the cavity isolated from outside conditions ; The six walls at the same temperature (32° F.) prevent any moisture migration. Any closed cubicle basically houses still air, provided no temperature difference exists between walls. Why is this important ? Because, in addition to moisture migration, temperature difference can stimulate air circulation, called convection. Again the six equal temperature walls in the cake of ice play an important role.

● A little book by Dr. Small of Glasgow University, entitled "First Steps in Heat Transfer," is remarkable for its clarity of treatment of a subject normally wrapped in mathematical acrobatics. The "first steps" comprise no fewer than 40 facets of the subject covered by approximately two pages each including a thumbnail illustration in most instances. It is essentially a book for making everyday calculations evaluating practical problems to be met by practical methods ; similarly the student who needs a grounding in the subject without or before attacking the massive tomes of authoritative works on the subject, will find it invaluable. Several worked examples are given, *inter alia* the effect of bulky insulation of low unit values in increasing heat flow instead of minimizing it.

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NEWS OF THE MONTH

Refrigeration and A-c. Exports.—During November 1959, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £775,696 weighing 1,184 tons, was exported from the United Kingdom. Comparable figures for November 1958 were 1,084 tons, worth £737,136.

* * *

Exports' Analysis.—Of the 1,184 tons of air-conditioning and refrigerating plant worth £775,696 exported by Great Britain in November—quoted in the preceding paragraph—58 tons went to the Union of South Africa, 30 tons to India, 62 tons to Australia, 48 tons to New Zealand, 25 tons to Canada, 115 tons to " other Commonwealth countries," 51 tons to Eire, 13 tons to Sweden, 422 tons to Western Germany, 47 tons to the Netherlands, 39 tons to Belgium, 96 tons to France, 6 tons to Italy, and 132 tons to " other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during November, quoted in the first paragraph, commercial refrigerators accounted for 537 tons, worth £269,325, industrial plant and equipment for 102 tons, worth £82,058, and refrigerating equipment and parts, including parts of commercial refrigerators, for 248 tons, worth £217,797.

* * *

Exports of Small Refrigerators.—During November, 814 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £519,303. The 814 tons comprised 60 tons to the Union of South Africa, 34 tons to Rhodesia and Nyasaland, 10 tons to India, 87 tons to New Zealand, 365 tons to " other Commonwealth countries and Irish Republic, 22 tons to Sweden, 7 tons to Western Germany, 6 tons to the Netherlands, 5 tons to Belgium, 5 tons to Italy, and 218 tons to " other foreign countries."

* * *

Gas Appliance Sales.—Sales of the major gas appliances continued at a high level in the second quarter of 1959/60. As a result the six months' sales of cookers increased from 262,000 in April to September 1958, to 374,000 in April to September 1959 (i.e. by 43 per cent.). Sales of gas space heaters increased by 42 per cent. and sales of water heaters by 34 per cent. Refrigerator sales nearly doubled from 26,500 to 51,000. Sales of wash boilers and washing machines were, however, 12 per cent. down on the previous year.

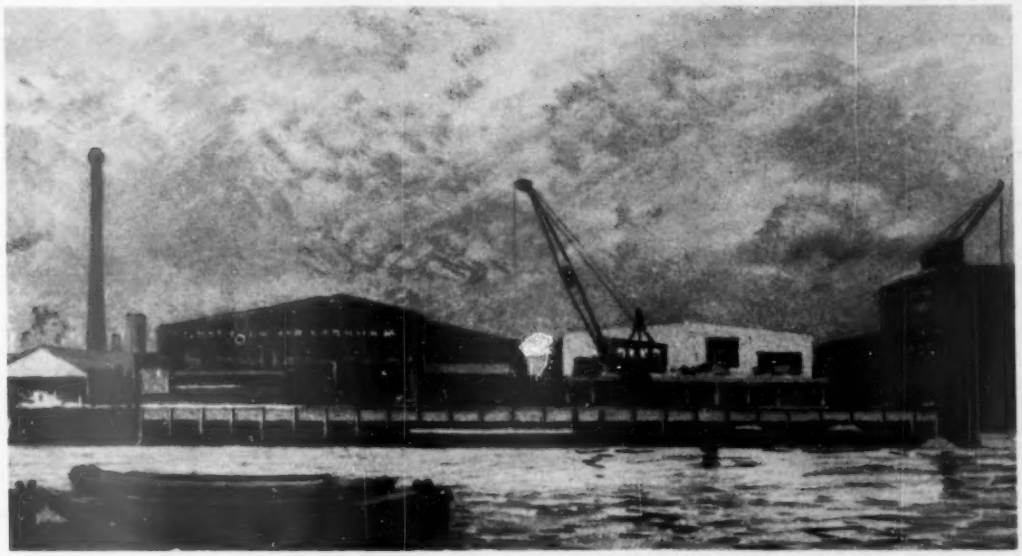
This 400-year-old mill at Newbury, Berkshire, was converted in 1959 into a food bank and poultry processing plant. It is being successfully operated by Deep Freeze Facilities Limited and was featured in the Christmas week Pathé-Pictorial feature film in London and the provinces. An additional 50-ton freezer was put into commission in December.

New Round-the-World Liner.—The Shaw Savill Line have placed with Vickers-Armstrongs an order for a passenger vessel to run in their round-the-world service in conjunction with s.s. *Southern Cross*, for delivery in April, 1962. The new vessel will carry about 1,400 passengers, all one class, and the passenger accommodation will follow, in general, the design which has proved so popular in *Southern Cross*. This included full air-conditioning of passenger spaces. The vessel will be of about 22,000 tons gross register with a speed of 21 knots, on a horsepower of 22,000 s.h.p., and will be built in Vickers-Armstrongs' Yard at Walker-on-Tyne. The revolutionary design initiated by *Southern Cross* and mentioned above includes having her engines and funnel aft; she will carry no cargo.

* * *

Two recent items in MODERN REFRIGERATION need correction. On page 1058 of the December issue we quoted Rayleigh Refrigeration Sales & Service, Ltd., of Leigh-on-Sea, Essex as being Marco distributors; in fact, Refrigeration and Electrical Appliances Ltd. in the same town are the sole Essex distributors for Marco and Rayleigh Refrigeration Sales & Service, Ltd., are sub-agents for them. The other mistake in 1959 was to be found on page 858 of the October number. The freezing room temperature for the liquid egg should have been *minus* 10° F.

PICTURE OF THE MONTH ★ A new skyline on Thames-side



NEW COLD STORE AT MILLWALL

THE well-known wool wharfing and warehousing firm, Weber, Cook and Garnham Ltd., are extending their business to embrace the storage of meat. Lacking the appropriate storage facilities they have under construction a cold store of 210,000 c.ft. capacity at Maconochies Wharf, Westferry Road, Millwall, E.14.

The main contractors are Smiths Insulations Ltd. of Burton-on-Trent who will use their well-known prefabricated technique of insulation. The store is being built on the riverside corner of the existing warehouse site which has had to be piled at one point to a depth of 45 ft. where the engine-room section is very close to the river. The construction is on two floors, using the envelope principal of insulation with an intermediate floor. The whole floor will be elevated to loading-bank height, which also provides an air space beneath as a protection against frost-heave.

The roof of the engine-room will be used as a loading dock to the first floor, providing quick and economical handling of the meat, which will come alongside in barges, directly into the store. Outloading will be by a separate loading dock at the other side of the store with double goods lifts to the first floor and a recessed platform weighing scale.

Bison pre-cast slabs are being used for both ground and first floors with granolithic finish. Internal finish will be polar white cement and dunnage battens will be included. Cooling will be by air via ducts and refrigeration plant by L. Sterne & Co. Ltd. to give an operating temperature of 14° F. Completion date will be mid-April 1960.

Modern Refrigeration's

TRIBUTE TO DoRDeC

Sales of domestic refrigerators during September, 1959, a total of 77,106, increased by over 100 per cent. on the same month in 1958—a total of 33,294. Total sales over the last nine months, show a comparative increase of 98 per cent. on 1958. The figures are : January to September, 1958, 363,016 ; 1959, 683,016. Demand began early in 1959 with January sales 150 per cent. up on last year. This reflects a significant change in the seasonal pattern for the domestic refrigeration industry which, up till now, has had to plan for a demand which reached its peak during the summer months—particularly during May and June—followed by a severe drop during autumn and winter. A considerable amount of credit for this upsurge in sales can be taken by The Domestic Refrigeration Development Committee.

THE Domestic Refrigeration Development Committee—DoRDeC—was formed in 1956. Its purpose was to promote the sales of domestic refrigerators and to put domestic refrigeration on the map with the Press and the public.

At that time domestic refrigerators were suffering from purchase tax of 60 per cent. credit sales restriction and a view strongly held in Government departments and largely in the press that the domestic refrigerator was a luxury and not a necessity. The immediate objective of DoRDeC was to bring about a complete change in this outlook, *i.e.* to emphasize that the domestic refrigerator is a necessity and not a luxury.

The original members of DoRDeC were :—

A.E.I.-Hotpoint Ltd.
Astral Equipment Ltd.
Electrolux Ltd.
English Electric Co. Ltd.
Frigidaire Division of General Motors Ltd.
The General Electric Co., Ltd.
Kelvinator Ltd.
Pressed Steel Co. Ltd.

In order to achieve its objectives DoRDeC decided that a promotion and public relations campaign was necessary. C. S. Services Ltd. (Mr. Claude Simmonds' organization) were appointed to undertake this work for DoRDeC.

In 1956 the industry could fairly be described as a depressed industry. Sales which had remained very low since the end of the war actually fell in 1956 from 228,000 (1955) to 187,965.

DoRDeC set out vigorously to change political and public opinion. Ministers of both the Treasury and the Board of Trade were approached and there was a series of meetings at which the industry set out its case for a reduction in purchase tax and its belief that this would result in greatly increased home sales and in a strengthening of the export market.

In the budget of 1958, as the direct result of these representations, purchase tax was reduced from 60 to 30 per cent. It was further reduced in the Budget of 1959 to 25 per cent. The relaxation and ultimate removal of hire purchase restrictions was a further incentive to expansion.

Parallel with this the interest of the press and of radio, both sound and television, has been increasingly obtained.

In 1958 sales were approximately double 1956 ; in 1959 it seems probable that sales will be double those of 1958. Domestic refrigerators have now become accepted as a major household appliance. References to household appliances, whether in the press, on radio or in political speeches, almost invariably include refrigerators and sometimes put them even ahead of television sets—this is something that would have been quite unthought of three years ago.

One of the most successful major activities of DoRDeC has been the Top Eight Show held as a preview to the Ideal Home Exhibition. This was first held at the Hungaria in 1957, and the guest of honour was Lady Eccles, wife of the then president of the Board of Trade. In 1959, when the theme was " domestic refrigerators for all," the guest of honour was Mrs. Bessie Braddock, M.P. It is intended to have a similar show in 1960. This will be on Thursday, February 25th. It is not yet definitely known who the guest of honour will be, but this will be announced shortly. The show will be at the Café Royal. Its title will be changed to the Top Ten Show since there are now two new members of DoRDeC. These are :—

Electrical Division of Radiation Ltd.
R. & A. Main Ltd.

With the growth of the domestic refrigeration industry, for which DoRDeC can certainly take credit, other new manufacturers are coming into the field and it is likely that the membership of DoRDeC will continue to grow. This membership is, of course, confined to U.K. manufacturers of domestic refrigerators.

A number of other special activities are planned for 1960. One of these will be a Teenagers' Party at Sheffield. It will be held at St. Mary's Community Centre, Sheffield, on January 27, and an interesting and unusual evening has been planned. If this is a

success other similar parties throughout the country will be arranged, all of them in co-operation with the National Association of Mixed Clubs and Girls' Clubs.

From the start of DoRDeC informal lunches with leading women writers and radio experts have been held. The idea of these has been to stimulate interest in domestic refrigeration and to learn the views of these people on the products being sold and in particular on the whole idea of domestic refrigeration. These lunches have been very successful and enjoyable. They are not intended as news occasions but as "frank talks" which they have always been and are certainly constructive. In the current year these will be continued but at least two of them will be held away from London : the first of these out-of-London lunches was, in fact, held in Manchester on December 16.

DoRDeC has now built itself up as an information bureau to the press, and sometimes as many as a hundred queries a week are received from women journalists and the B.B.C. as well as from members of the public. These are on all sorts of subjects, ranging from a request for an ice cream recipe to an enquiry about a refrigerator small enough to travel backwards and forwards between town and country in the boot of a family car. But, as a matter of interest, the sensible use of a refrigerator and the storage of food rank well ahead of other enquiries.

Some leading personalities in DoRDeC and C.S.C. Second from right, Mr. E. G. Rowledge, Prestcold, chairman of the Domestic Refrigeration Development Committee; extreme right, Mr. M. A. Craig, Electrolux Ltd., vice-chairman of DoRDeC; centre, Mr. G. E. Worssam, Frigidaire Division of General Motors, Ltd., committee member; second from left, Mr. Claude Simmonds, managing director, C.S. Services, Ltd., secretary of the committee; extreme left Col. R. A. R. Fanshaw, R. & A. Main, Ltd., who lately joined DoRDeC.

West Instrument, Ltd., of Brighton, have recently started manufacturing a resistance temperature controller and indicator of entirely new design which takes them into the field of low-temperature control. This company has, until now, specialized in instruments for the plastics, laboratory, furnace and other industries requiring control at temperatures above 200° C. The new instrument, which is available with stepless, proportioning and on/off control, is suitable for a wide span of operating temperatures and offers precision control and indication to below − 100° C.

Proposed Values for the Thermal Conductivities of Some Liquid Refrigerants

By R. W. POWELL, D.Sc., Ph.D., F.Inst.P., and A. R. CHALLONER
(*Communication from Basic Physics Division, National Physical Laboratory*)

Abstract

A supplementary account is given of work described at the Tenth International Congress of Refrigeration. New results are presented for the thermal conductivities of the liquid refrigerants $CFCl_3$, CF_2Cl_2, CF_3Cl, $CHFCl_2$, CHF_2Cl, $CFCl_2$, CF_2Cl and CF_2ClCF_2Cl for the approximate range 25° to –25° C. Some suggested most probable values are tabulated, which are average values based on the results of Riedel, Cherneyeva and those of the present work.

THE unsatisfactory state of knowledge regarding the thermal conductivities of some liquid refrigerants has already been referred to in MODERN REFRIGERATION by one of the present authors.[1 2] The results of work undertaken to clarify the position have recently been reported to the Tenth International Congress of Refrigeration and it is now thought desirable to supplement this paper[3] by a rather more detailed account.

The liquids studied were samples of "Arcton" refrigerants and were supplied in sealed metal bottles. They were regarded as of normal commercial purity and no independent analyses were made. The thermal conductivity determinations were made in an apparatus of the guarded hot-plate type[4] which had been modified to remain gas-tight at pressures of several atmospheres and which could be cooled to temperatures of the order of –30° C. A sketch of this apparatus is given in fig. 1. This appeared in the congress paper and calls for no further description. The

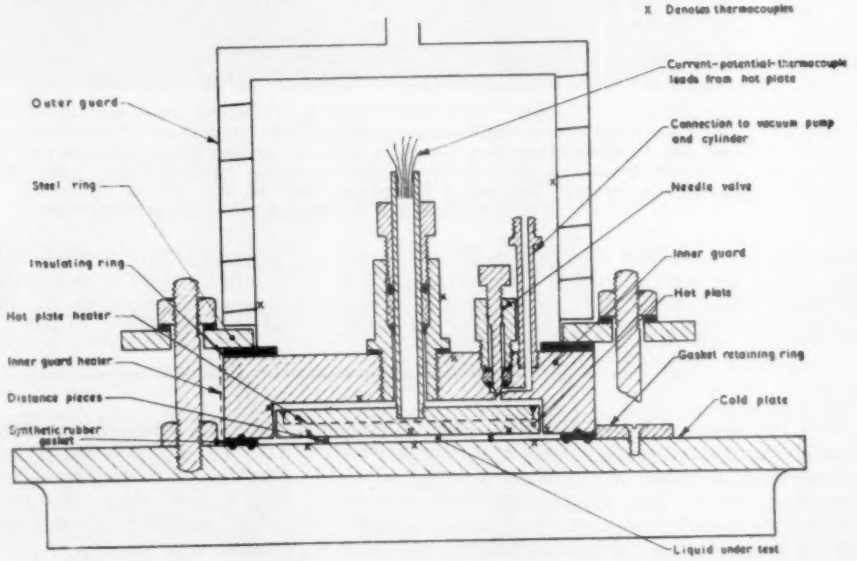


Fig. 1. — Guarded plate apparatus used for thermal conductivity determinations on liquid refrigerants.

auxiliary filling apparatus shown in fig. 2 was screwed to the pipe leading to a needle valve in the inner guard cover. With the valve A closed but all other

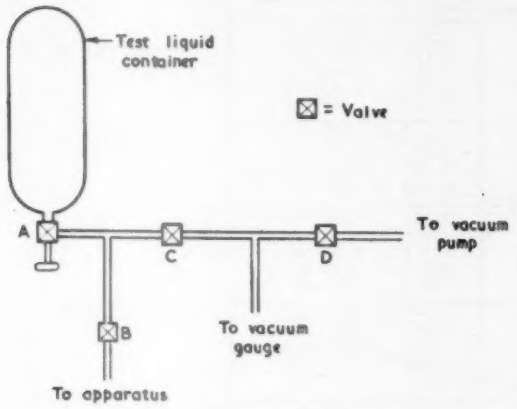


Fig 2.—Apparatus filling system.

valves open it was possible to completely evacuate the test apparatus and to check it for gas-tightness. Valve C was then closed and A opened. This allowed the test liquid to flow from the inverted containing bottle into the test apparatus, after which valves A, B and the needle valve were closed and the auxiliary filling apparatus removed. Weighting the bottle before and after served as a check that sufficient liquid had passed into the apparatus to entirely envelope the hot plate. The 3-mm. layer of liquid under test was in contact with the lower face of this plate and freedom from entrapped vapour could be safely assumed.

For measurements at temperatures above room temperature the outer guard was an electrically heated metal cover, whilst for lower temperatures the arrangement shown in fig. 3 was used. The outer cover was then a double-walled metal sh oud through which a portion of the main cooling fluid could be passed at an independently controlled temperature.

The experimental results obtained are given in Table I and are plotted in fig. 4. For all but CF_3Cl a range of from about 25° to –25° C. has been covered and straight lines have been fitted to these results. The steeper decrease in thermal conductivity with increase in temperature noticeable for CHF_2Cl is probably connected with its lower critical temperature. Figs. 5 and 6 show how the present results for $CFCl_2$, CF_2Cl and CF_2Cl_2 respectively compare with those of other determinations. For the former fluid the results are seen to be in general agreement with the preliminary data reported from tests made in a similar type of apparatus[1] and obtained by Challoner, Gundry and Powell[5] in a radial heat flow apparatus. With regard to the data of other workers,[6–11] those of Riedel[7] and Cherneyeva[10 11] were usually within 10 per cent. of the present values, but the results of Markwood and Benning[8] were consistently high by from 11 to 27 per cent. This last result was not unexpected, since recent work has shown that the method which they used appears to give high values for liquids of low thermal conductivity. Furthermore, they calibrated the apparatus in terms of Bridgman's values[12] for the thermal conductivities of ethyl alcohol and toluene, which values have been shown to be respectively 9·5 and 13 per cent. greater than those which we have obtained.[13]

Since the values of Markwood and Benning have in the past been widely adopted for these refrigerants it seems desirable to replace them by lower values and some suggested values which are considered to represent the thermal conductivities of these refrigerants as commercially available to within 5 per cent. are given in Table II. These are average values based on the present work and the results of Riedel and Cherneyeva.

Acknowledgements

The authors are indebted to the Imperial Chemical Industries who supplied the samples of " Arcton " refrigerants used in the above investigation.

The work has formed part of the research programme of the National Physical Laboratory and this paper is published by permission of the Director of the Laboratory.

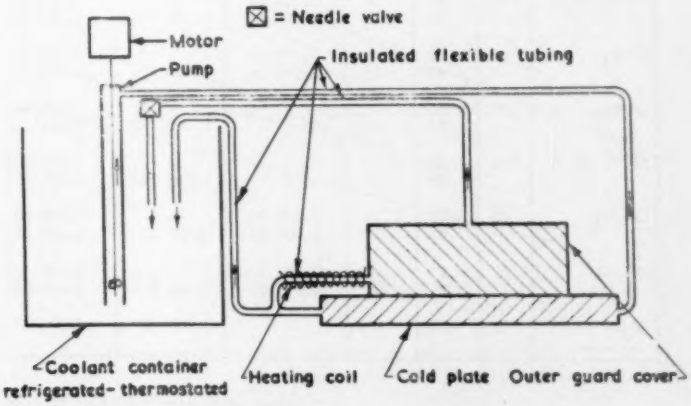


Fig. 3.—Diagram of apparatus for measurements below room temperature.

Experimental Results

Refrigerant	No.	Temperature °C				Thermal Conductivity J cm/cm² sec deg C
		Hot face	Cold face	Difference	Mean	
$CFCl_2.CF_2Cl$	113	31.209	26.189	5.020	28.70	0.000 775
		10.917	6.100	4.817	8.51	0.000 813
		- 3.785	- 8.480	4.695	- 6.13	0.000 833
		- 15.906	- 20.414	4.508	- 18.16	0.000 855
		26.051	21.042	5.009	23.55	0.000 766
$CFCl_3$	11	18.299	14.249	4.050	16.27	0.001 003
		5.035	1.096	3.939	3.07	0.001 018
		- 5.419	- 9.331	3.912	- 7.38	0.001 029
		- 18.249	- 22.121	3.872	- 20.18	0.001 062
$CHFCl_2$	21	7.399	3.976	3.423	5.69	0.001 156
		- 7.783	- 11.126	3.343	- 9.45	0.001 199
		- 25.192	- 28.374	3.182	- 26.78	0.001 261
		16.679	13.143	3.536	14.91	0.001 124
		34.820	31.118	3.702	32.97	0.001 056
$CF_2Cl.CF_2Cl$	114	15.229	9.545	5.684	12.39	0.000 685
		3.692	- 1.728	5.420	0.98	0.000 714
		- 7.092	- 12.362	5.270	- 9.73	0.000 740
		- 7.011	- 12.362	5.351	- 9.69	0.000 730
		- 20.441	- 25.499	5.058	- 22.97	0.000 772
CF_2Cl_2	12	29.578	24.192	5.386	26.88	0.000 726
		7.169	2.266	4.903	4.72	0.000 801
		- 13.063	- 17.866	4.803	- 15.46	0.000 819
		- 20.909	- 25.194	4.285	- 23.05	0.000 920
		- 20.853	- 25.194	4.341	- 23.02	0.000 908
CHF_2Cl	22	18.241	14.157	4.084	16.20	0.000 965
		- 12.391	- 15.871	3.480	- 14.13	0.001 142
		13.327	9.298	4.029	11.31	0.000 969
CF_3Cl	13	13.941	11.998	1.943	12.97	0.000 607
		14.192	12.032	2.160	13.11	0.000 544*
		14.308	12.007	2.301	13.16	0.000 509*

Table I.

* Values decreasing with time due presumably to liquid film becoming partially replaced with vapour

Table II.

Thermal Conductivity Data for liquid Fluoro-chloro Methanes and Ethenes and Suggested Most Probable Values

Liquid Refrigerant	No.	Temperature		Thermal Conductivity (J.cm/cm² sec deg C)			Most Probable Thermal Conductivity	
		°C	°F	Cherneyeva	Riedel	Present Work	J cm/cm² sec deg C	B.t.u. ft/ft² hr deg F
$CFCl_2.CF_2Cl$	113	- 20	- 4	0.000 80	-	0.000 86	0.000 83	0.048
		20	68	0.000 72	$0.000\ 75_5$	0.000 79	0.000 75	0.043_5
$CFCl_3$	11	- 20	- 4	0.001 07	-	0.001 06	0.001 05	0.060_5
		20	68	0.000 95	$0.000\ 89_5$	0.000 99	0.000 95	0.055
$CHFCl_2$	21	- 20	- 4	-	-	0.001 24	0.001 24	0.071_5
		20	68	-	0.001 08*	0.001 10	0.001 09	0.063
$CF_2Cl.CF_2Cl$	114	- 20	- 4	-	-	$0.000\ 76_5$	$0.000\ 76_5$	0.044
		20	68	-	$0.000\ 66_5$	$0.000\ 66_5$	$0.000\ 66_5$	0.038_5
CF_2Cl_2	12	- 20	- 4	0.000 90	-	0.000 88	0.000 89	0.051_5
		20	68	0.000 72	0.000 72	0.000 75	0.000 73	0.042
CHF_2Cl	22	- 20	- 4	$0.001\ 03_5$	-	$0.001\ 17_5$	0.001 10	0.063_5
		20	68	0.000 87	0.000 93*	$0.000\ 92_5$	0.000 91	0.052_5
CF_3Cl	13	20	68	-	0.000 58*	0.000 61	0.000 6	0.035

* Value predicted by Plank[14] from Riedel's data

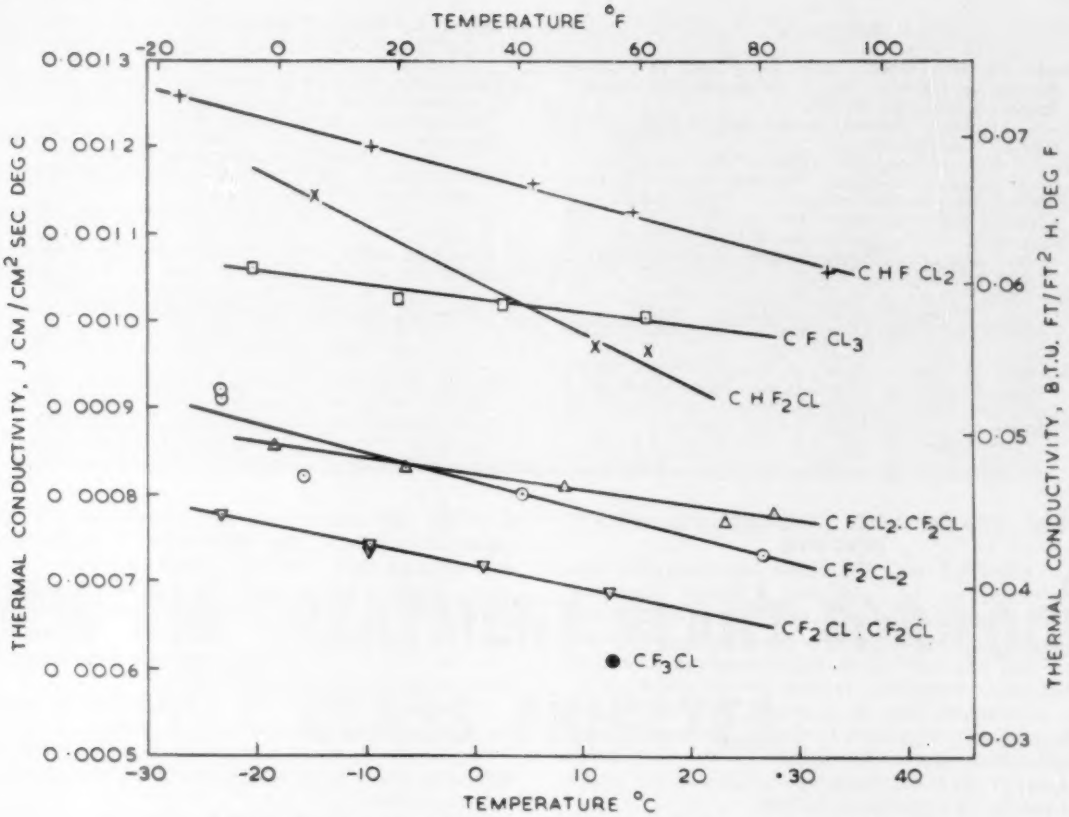


Fig. 4.—Thermal conductivities of liquid fluorochloromethanes and fluorochloroethanes.

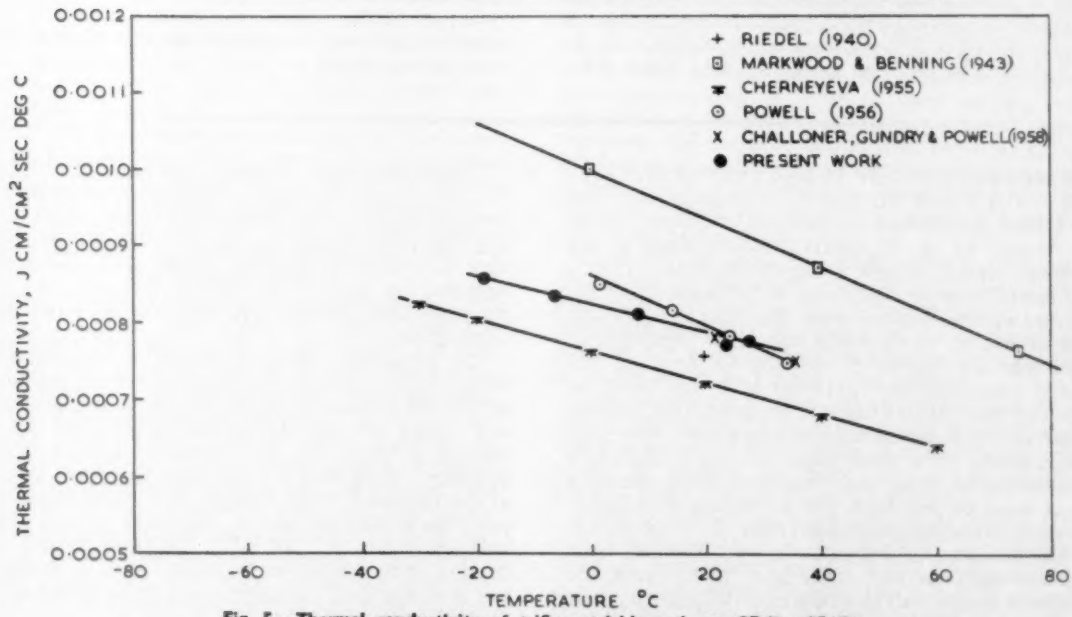


Fig. 5.—Thermal conductivity of trifluorotrichloroethane, $CF Cl_2$ CF_2Cl

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1. Amongst U.K. firms there is too little appreciation of the size and importance of the Scandinavian market. At present British goods are bought there at a rate of £10 to £20 per head of population. In the U.S.A. the rate per head is only 32s. 6d. There exists a feeling that because the four Nordic markets are regarded as "easy" they receive too little attention as compared with "difficult" dollar markets.

2. Nordic markets could be opened up without great difficulty by U.K. firms who took trouble to cater for their needs.

3. German success in these markets is the result of sheer persistence in selling drive.

4. Setting up one's own subsidiary is the most satisfactory selling method for U.K. firms.

5. Appointment of agents in Nordic countries should be made by personal visits of top management representatives.

6. Every use should be made of exhibitions, advertising and market information.

Copies of the report are obtainable from F.B.I. print and publications department, price 4s., post free —excluding airmail.

BRINE FREEZING OF TURKEYS IN SCOTLAND

A SUCCESSFUL turkey processing plant has been established at Balgour, Dunning, Perthshire, by A. S. Dixon, vice-chairman of the Scottish branch, British Turkey Federation. During the recent Scottish conference at Gleneagles, the 200 visitors went to Balgour to see this plant in operation, and to inspect, in particular, the brine freezing unit. This was the first to be installed in Scotland, for turkey purposes, and at Balgour it has done an excellent job. Mr. Dixon told his guests that Balgour began turkey breeding and processing some nine years ago, starting on a small scale. It was essentially a commercial breeding and processing plant, breeding being done on one farm and processing at Balgour. Breeding is on straightforward lines, from incubation to tier brooders, and then to haybox brooders from four to eight weeks. Thereafter the turkeys are housed in compounds to 20 weeks, all killing of popular weight birds being done at that stage.

The finished birds are then taken to Balgour where Mr. Dixon has laid down a compact, straight-flow processing plant which handled the entire output from this enterprise as well as birds for other growers who have no processing facilities of their own. These are delivered to Balgour in 200 to 300 lots and are processed and packed and sold on the producers' instructions.

The processing plant is housed in an asbestos-roofed Nissen hut type building, birds being delivered to the self-contained killing section at the receiving end. There they are killed, bled, plucked and passed through a hatch into the evisceration section of the building. Work here is on straight flow lines, ending at the Hallmark brine freezing unit, from which the birds are transferred into the Hallmark holding store with a capacity of 2,000 c.ft. The brine freezer was the first to be introduced for turkey work in Scotland and is on standard Hallmark lines, giving prime oven-ready Cryovac packed turkey at −10° F.

H.M.S. "Loch Lomond."

NEW AIR TREATMENT PLANT FOR LOCH CLASS FRIGATES

NEW air treatment plants have been included in extensive refitting schemes for Loch class frigates. These plants, which incorporate York Shipley water chilling systems and separate air treatment units, are replacements for a number of self-contained individual units which had previously been employed.

Primarily designed for anti-submarine convoy escort duties, 17 Loch class frigates were laid down between August 1943 and March 1944. After the War a number were converted to depot or repair ships ; some were sold or scrapped, while those retained in service have now been scheduled for complete refit for service both at home and overseas.

The first of these frigates to be refitted was the *Loch Lomond* recently completed at H.M. Dockyard, Sheerness. Incidentally, the *Loch Lomond* was also the last ship to be refitted at Sheerness before the recent closing of the dockyard, and was a principal feature in a special closing ceremony.

Two water-chilling systems were installed in specially converted compartments. Lack of space created installation difficulties and necessitated the complete removal of some of the ship's side plates. Each installation comprises a York 3¾- by 3-in. six-cylinder compressor directly coupled to an electric motor ; shell and tube type evaporator and condenser. This latter is arranged for sea-water cooling, a Worthington Simpson Ltd., centrifugal pump being incorporated. In the event of an emergency this pump can be by-passed by the operation of a valve which connects the cooling system with the fire main.

The water-chilling systems are arranged for automatic control and in order to meet varying load demands each compressor set permits capacity reduction from 100 per cent. of full load down to 33⅓ of full load in two equal steps. Operation of the unloader mechanism is automatic as dictated by a stepped thermostat which operates by a variation in temperature of the chilled water.

Chilled water from the York plant is circulated around the air treatment units by a Drysdale centrifugal pump working against a maximum head of 30 ft. Seventeen cubic feet of water is held for circulation, possible loss being compensated for by the inclusion of an expansion tank kept under pressure.

The air treatment units, which consist mainly of tubular header coils, receive the chilled water through a Spirax Sarco three-way valve, thermostatically controlled to regulate the flow. For visual check a Venturi meter is fitted to the supply side.

The coils, which were supplied by F. H. Biddle Ltd., comprise horizontal ½-in. o.d. 20-gauge soft annealed arsenical solid-drawn copper tubes conforming to B.S. 2017/1953 expanded onto the collars of smooth vertical fins. Fins are of tinned copper, the copper

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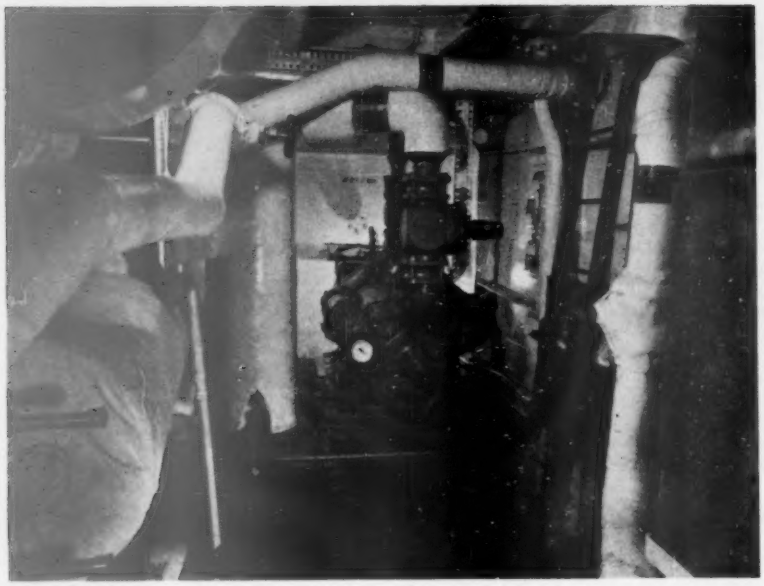


A view of one of the two plant rooms showing the York 3½ x 3 in. six-cylinder compressor, with shell and tube type evaporator and condenser. Watford control panels are in right foreground.

being of high thermal conduction 99·9 per cent. pure and soft annealed.

Fourteen such units have been placed in cabins, sick bay, crew's quarters and other parts of the ship. The air itself is passed through the units by centrifugal fans and ducting. A manually operated valve adjusts the amount of fresh air which shall be added to the air being circulated.

New Companies

The accompanying particulars of New Companies recently registered are taken from the Daily Register compiled by Messrs. Jordan and Sons Ltd.

J. W. Growbridge Ltd., 502, Carlton Road, Nottingham. To carry on business of retailers of washing machines, cookers, spin dryers, refrigerators, etc. Nominal capital: £2,000. Permanent directors: John W. Growbridge, 502, Carlton Road, Nottingham; Lilian Growbridge.

Immersion Coolers Ltd., 5, Oak Green Nurseries, Tonbridge, Kent. To carry on the business of manufacturers of and dealers in refrigerators; specialists in refrigeration and cooling processes, etc. Nominal capital: £1,000. Permanent directors: Dr. Laurence Barsey, 303, High Street, Dorking; John P. Ashcroft, 5, Oak Green Nurseries, Tonbridge. Solicitors: Hart Scales & Hodges, Dorking.

J. & D. Clayton (Imports) Ltd., 49, Upper Brook Street, W.1. To carry on the business of importers and exporters of refrigeration equipment, domestic appliances, etc. Nominal capital: £2,000. Directors: Derek S. Clayton, 42, The Grove, Edgware, Middx; Rosalind B. Clayton, 42, The Grove, Edgware, Middx.

Welling Domestics Ltd., 198/204, Lewisham High Street, S.E.13. Secretary: J. Stukings. To carry on business of wholesalers and retailers of refrigerators, washing machines, etc. Nominal capital: £100. Directors: Joseph Stukings and Derek J. Stukings, 27, Forest Ridge, Keston, Kent; Charles G. Allen, "Broomcraft," Forest Ridge, Keston, Kent.

Peltier Cooling Devices Ltd., 15, Cromwell Road, S.W.7. Secretary: G. H. Wright. To carry out research work in the field of thermo-electricity and its application to refrigeration, etc. Nominal capital: £100. Directors: Henry G. De Laszlo, Pentlands, Middle Hill, Engelfield Green; Edgar A. Haslam, 33, Offington Gardens, Worthing.

P. H. Thermal Products Ltd., Westgate, Baildon, Yorks. To carry on business of manufacturers of and dealers in insulating materials, etc. Nominal capital: £5,000. Directors: Peter H. Hill and Judith P. Hill, 30, Moorfield Drive, Baildon. Solicitors: Ernest Hind & Co., Bradford.

Powell Duffryn Modulair Ltd. To carry on business of dealing, assembling and manufacturing, heating, ventilating, air treatment and conditioning appliances, apparatus, etc. Nominal capital: £10,000. Directors: William H. Sharland, Ernest B. Overton, Reginald H. Stewart and Barrie Heath, addresses not stated. Subscribers: D. W. Dare, J. B. A. Willis and L. St. John T. Jackson, all solicitors of 18, Austin Friars, E.C.2. Registered by solicitors: Slaughter & May, E.C.2.

William Norwood Ltd. To acquire that part of the undertaking of W. Norwood & Sons Ltd., which comprises the retail business of that company, and to carry on business of meat salesmen, etc. Nominal capital: £8,300. Director: to be appointed by subscribers. Subscribers: Cecil Harvey and Charles J. Purnell, 22, St. Andrew Street, E.C.4. Registered by Solicitors' Law Stationery Society Ltd. Solicitors: Pontifex Pitt & Co., E.C.4.

Hatton & Banks Ltd., 88, Mosley Street, Manchester, 2. Secretary: E. H. Hatton. To carry on business of maintainers and repairers of and dealers in refrigerators and cold-storage plant, etc. Nominal capital: £1,000. Directors: Eric H. Hatton, 11, Stretton Road, Whalley Range, Manchester, 16; Douglas A. Banks, 24, Park Avenue, West Didsbury, Manchester, 20. Registered by Snaw & Sons Ltd.

General Refrigeration Ltd. To take over business of a refrigeration engineer carried on at Dorking, E. M. L. Powell as "General Refrigeration," etc. Nominal capital £100. Directors: Edwin M. L. Powell and Mrs. Marion M. P. Powell,

(*continued on page 98*)

Providing Specific Transport Environments Consistent with Commodity and Market Requirements

By A. LLOYD RYALL

THE refrigerated transport of fresh fruits and vegetables would be much simplified if one temperature were optimum for all of the various kinds shipped. Unfortunately this is not so, for a low temperature which is ideal for one kind of fruit or vegetable may be highly injurious to another, whereas an intermediate temperature suitable for products susceptible to chilling injury would result in heavy waste of highly perishable products.

The development of mechanically refrigerated rail cars and trucks with thermostatically controlled temperature is undoubtedly the ultimate solution to the varying temperature requirements of perishable commodities. However, as of January 1, 1959, there were available for the transport of fresh fruits and vegetables and frozen foods in the U.S.A. only 3,382 mechanically refrigerated cars and demand from frozen-food packers for these cars is such that they are not often available for the transport of fresh products. This number of mechanical cars represents only slightly over 3 per cent. of the total freight and express refrigerator cars in service in the U.S.A. It is thus apparent that for the present, and for some time to come, such temperature control as is attained in long-distance shipments must be largely in the conventional ice-refrigerated rail car.

Commodity temperatures during transit in an ice-refrigerated car are, of course, related primarily to the quantity of ice supplied to the bunkers. Assuming that car construction and insulation are standardized, other factors which effect results are (1) temperature of the load at the start of the transit period (2) respiratory activity of the product (3) outside temperatures to which the shipment is exposed in transit and (4) additions of sodium or calcium chloride to the ice to lower the refrigerating surface temperature. Of these factors, we have some control over, or specific knowledge of, each except outside temperature. Therefore, in calculating refrigeration requirements we start with three factors which are reasonably well known and one which, while unknown, is subject to estimate based on the mean seasonal temperatures in the climatic zone through which the shipment will pass.

Since transcontinental shipments of perishables by rail freight in the U.S.A. require from 8 to 10 days to move from coast to coast, it is apparent that temperatures substantially above or below the optimum during transit could result in material deterioration. Of course, some of the most perishable products, such as fresh strawberries, commonly move from the Pacific to the Atlantic Coast by refrigerated railway express in about five days or by refrigerated truck in four to five days. This reduced time obviously does not eliminate the need for proper temperatures, since strawberries will deteriorate greatly in 24 hours if not adequately refrigerated.

For convenience, fresh fruits and vegetables can be grouped into several general classes in considering temperature requirements. First are highly perishable fruits such as fresh strawberries, sweet cherries and figs and equally perishable vegetables such as lettuce, sweet corn and broccoli. All of these products are ideally held at 31° to 32° F. and fortunately none of them is subject to chilling injury. Consequently, these shipments move consistently under maximum icing services and usually with salt at amounts of 1 to 3 per cent. of the ice added.

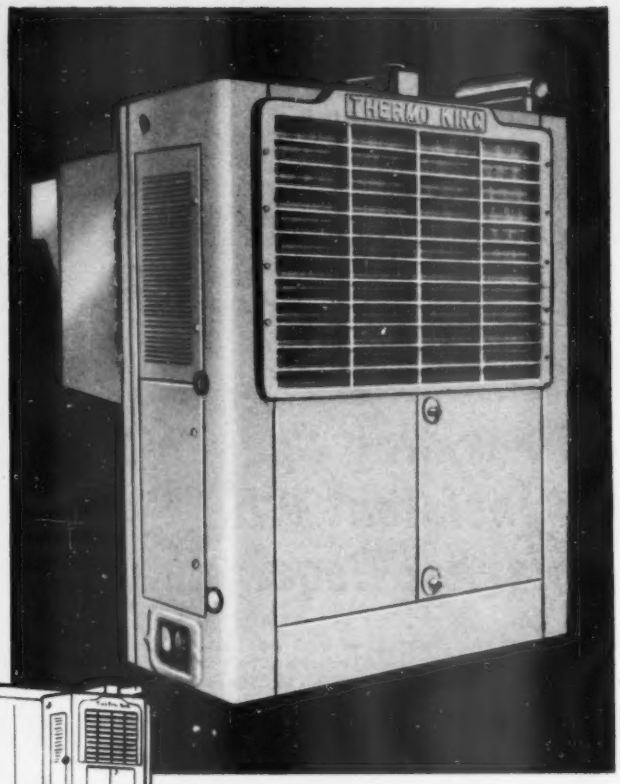
A second class in the temperature grouping includes those fruits and vegetables that tolerate low temperatures, and for which 32° F. storage is generally recommended. However, the products are much less perishable than those in the first class and so for limited transportation periods temperatures up to 40° F. are ordinarily acceptable. In this class are apples, pears, most of the tree nuts, carrots, cabbage and turnips.

LOW TEMPERATURE SENSITIVITY

The problems of refrigerated transport become much more complicated when the products involved are sensitive to low temperature. Certain fresh fruits and vegetables are known to be injured by exposure to low temperatures well above the freezing point of the plant tissues. We refer to this broadly as chilling injury, but even among those products which are susceptible, sensitivity varies widely as to temperatures and periods of exposure which are harmful. For example, bananas (recommended holding temperature 56° to 60° F.) can be seriously damaged by exposure to temperatures below 50° F. for less than a day, whereas mature-green tomatoes (above 55° F. recommended) usually will withstand several days below 50° without measurable injury. Grapefruit, which is known to be sensitive to temperatures below 50° F., can usually be stored for two to three weeks at 40° without visible injury. Thus, we have a third class of fresh products which require special temperature conditions because of susceptibility to chilling injury. Since the sensitivity is not the same for each commodity, it is essential that the special requirements of the commodity be considered in planning the transit service.

The above discussion has considered transit protection of those commodities to which refrigeration is applied during transit for the primary purpose of slowing ripening or deterioration from decay organisms. However, special situations exist where the need in transit is for elevated rather than reduced temperatures. For example, in the transport of freshly packed sweet potatoes, elevated temperatures may be desirable to

The KING of refrigeration equipment in the KING of bodies



BONALLACK & SONS LTD.

are pleased to announce to all users of refrigerated transport that as Distributors for THERMO KING TRANSPORT MECHANICAL REFRIGERATION EQUIPMENT they now offer their well-known and comprehensive range of insulated bodywork complete with this superb refrigeration unit.

We feel justified in claiming that a BONALLACK BODY and THERMO-KING Equipment are truly an alliance of "Kings" and shall be delighted to receive your enquiries.

Without question the finest equipment of its type, it

- ★ occupies almost no payload space,
- ★ is far more powerful than any other unit of equivalent weight,
- ★ is entirely self-contained
- ★ has fully automatic temperature control,
- ★ is the only mechanical refrigerated unit on the market which has been specifically designed for Road Transport.

A BONALLACK Body

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Light Metal Body Engineers. Specialists in Insulated and Refrigerated Bodywork of all kinds.

stimulate rapid formation of wound periderm. For this purpose it may actually be desirable to apply rather than remove heat. This is true in the movement of precut seed potatoes where rapid healing of cut surfaces is needed. Other commodities that could be grouped in the class requiring special services include immature table-stock potatoes which are benefited by some healing of skinned surfaces ; early-season Bartlett pears for which some ripening is desirable during transit ; and certain varieties of fall and winter pears that sell to better advantage when preripened and for which transit time could be advantageously used. Not all of these services would require the application of heat. Many, particularly those occurring during warm seasons, could be accomplished by the judicious use of controlled ventilation or by modified icing procedures.

How then do we arrive at the actual transit requirements for specific commodities and how do we translate this into practical transit services ? This discussion will consider only conventional ice-refrigerated rail and truck units, for approximately 97 per cent. of the rail equipment available in the U.S.A. for the transport of fruits and vegetables is of this type.

As indicated earlier, when the factors of heat leakage, loading temperature, vital heat production and outside temperature are known or can be reasonably estimated, the refrigeration needed for meeting specific temperature requirements can be rather accurately calculated.

Taking for an example a carload of mature-green tomatoes moving from California to New York City during late September, calculation of needed refrigeration can be made as follows :

SENSIBLE HEAT (load consists of 650 wooden lugs with 32 lb. of tomatoes in each).

Fruit (cooled from 80° to 55° F.). 20,800 (lb.) × 25 (°F. removed) × (specific heat) = 478,000 B.t.u.

Boxes and bracing (cooled from 80° to 55° F.). 5,500 (lb.) × 25 (°F. removed) × 0·33 (specific heat) = 45,375 B.t.u.

Car interior, 8,820 (lb.) × 25 (°F. removed) × 0·33 (specific heat) = 72,765 B.t.u.

VITAL HEAT (produced by fruit cooling from 80° to 55° F. in 3 days).

Tomatoes at 80° F., 1 day — 10·4 (tons) × 9,900 (B.t.u./ton/day, calculated from average CO_2 evolution at this temperature) = 102,960 B.t.u.

Tomatoes at 70°F., 1 day — 10·4 (tons) × 7,040 (B.t.u./ton/day) = 73,216 B.t.u.

Tomatoes at 60° E., 1 day — 10·4 (tons) × 5,170 (B.t.u./ton/day) = 53,768 B.t.u.

HEAT LEAKAGE FROM OUTSIDE (Daily outside mean temperature 75° F.) 1,400 (sq. ft. outside surface of car) × 0.092 (K factor with 3 inches of insulation) × 20 (°F. temperature differential) × 72 (hours) = 185,472 B.t.u.

After converting these figures to actual ice requirements we have the following : —

	B.t.u.	Ice required lb.
Sensible heat		
Fruit	478,000	3,320
Boxes and bracing	45,375	315
Car interior	72,765	500
Vital heat		
First day	102,960	715
Second day	73,216	505
Third day	53,768	375
Heat leakage		
First 3 days in transit	185,472	1,290
		Total 7,020

Thus, we see that the ice requirement for this load is about 3·5 tons for the first 3 days in transit. Maintenance of desirable temperatures in a carload of tomatoes moving under these conditions would require that the car be initially iced, after loading, with 3·5 tons of ice. The above calculation does not, of course, include any refrigeration allowance for vital heat production and heat leakage for the period from the fourth through the eighth day in transit. Assuming that the tomato temperatures remain at or near to the 55° F. desired, the vital heat produced would melt only about 275 lb. of ice a day and heat leakage would be a minor factor in shipments moving across the northern part of U.S.A. during late September. Thus, the decision as to whether to add any ice to the car in transit and where to add it would depend upon the shipper's information on current weather and the receiver's instructions as to the amount of ripening desired at market arrival. Under normal fall weather conditions the load temperature would increase 2° to 3° F. each day after the ice was exhausted if no additional ice was added in transit.

The author of this article is Head, Quality Maintenance and Improvement Section, Agricultural Marketing Service, U.S. Department of Agriculture, Beltsville, Md., U.S.A., and he gave this information to the International Congress of Refrigeration in Copenhagen.

PERMANENT COLLAPSIBLE DUNNAGE INVENTION

THERE was held recently on board the Shaw Savill liner *Athenic* a demonstration of a securing arrangement which enables an insulated compartment to be fitted out with permanent collapsible dunnage battens, which can quickly be brought into use whenever required for the carriage of refrigerated cargoes. Among those present were representatives of Lloyd's Register of Shipping, The Refrigerated Research Council, New Zealand Dairy, Fruit and Meat Boards, Australian Meat Board, Port Health and other interested organizations. These collapsible battens form an integral part of the ship's fittings, and when not required can be housed in a minimum of space. It is estimated that this type of fitting, in the housed position, will reduce the width of any compartment by only 2 in. All swivels, brackets and securing bolts, are either galvanized or Sherardized to avoid rust damage. The battens are made preferably of treated wood or any suitable material which is untaintable and can be easily cleaned. Therefore renewals should be required only through abnormal wear and tear.

This type of dunnage can be laid as loading progresses. If it is necessary to batten the compartment completely prior to loading, the operation can be effected by one man in a very short space of time. A locker normally taking two carpenters five working hours to batten out with 2 in. by 2 in. timber at 12 in. centres, can be prepared by one man in under 30 minutes. Furthermore, after completion of discharge the battens can be housed speedily with a minimum of labour. This innovation is the invention of Captain O. O. Thomas, assistant cargo superintendent of the Shaw Savill Line in London. Assembly of the construction and the making of the battens were carried out by Shaw Savill's joinery department. All metal fittings were supplied by the Kings Cross Truck Co., of Ealing. Application for letters patent has been made under 25572/5.

The great volume of meats sent from overseas countries to the United Kingdom is almost solely shipped by British refrigerated ships with an average capacity of about 500,000 c.ft., and very often this type of ship has large passenger accommodation. Other vessels in the meat trade are smaller, about 200,000 c.ft. An important feature of trade in the past few years has been the marked growth in imports of meat into many Continental European countries and especially into Germany and Italy.

A WIDE VARIETY OF REFRIGERATED ROAD VEHICLES

serves Britain's perishable food needs

MANN Egerton & Co. Ltd. of Norwich, one of the leaders in this specialized bodybuilding field, have lately produced three interesting examples of large containers—one supplied to Midland Counties Dairies Ltd., one to Grounds Transport

Mann Egerton's conversion of Standard Atlas van.

Services Ltd., and the remaining one is a semi-trailer, believed to be the first of its kind since it is fitted with a Thermo King unit.

Mann Egerton's latest addition to their standard range is a conversion of the Standard Atlas 10 to 15 cwt. van. It is an insulated conversion incorporating the normal body of the vehicle as the outer skin, and is particularly suitable for local deliveries of chilled products, or deep frozen foods and ice cream—though for the latter it would be necessary to add dry ice. It is available with an insulated rear door or insulated side door as illustrated.

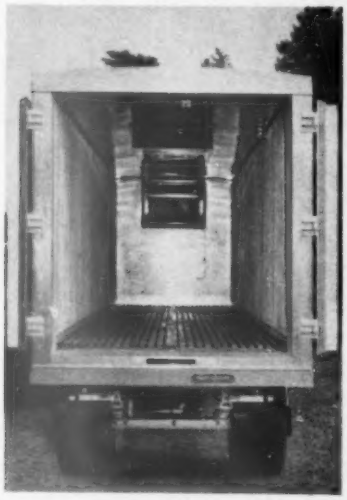
Built by Mann Egerton, and fitted with a Thermo King refrigeration unit, this 25 ft. semi-trailer mentioned above is the first vehicle of its kind so fitted operating in Britain to-day. It is a standard production and others are already under construction.

Mann Egerton 25-ft. 10-ton semi-trailer.

Mann Egerton 7-ton diesel.

The 10 to 11 ton semi-trailer has a storage capacity of approximately 1,000 c.ft., the increased payload being made possible by using the Thermo King unit which fits easily on the front of the container, instead of the interior of the compartment. Other notable features of this unit are : (1) Its compactness. It is only half the size of normal refrigeration equipment required to do the same job ; (2) It can be operated by a petrol engine or electric motor—changeable from one to the other by means of one switch, and is fully automatic ; (3) Trunking in the container ensures that cold air is evenly distributed over the whole length of the body. The temperature can be reduced to –20° F. and refrigeration is by forced convection.

The Commer 7-ton diesel truck illustrated is fitted with a Mann Egerton container, 18 ft. long, with a capacity of over 700 c.ft. It is insulated with 4 in. of polystyrene and has a superfreeze-type rear door. The refrigeration equipment is housed in a transverse compartment at the front of the container with wire mesh ventilation. The Kelvinator compressor is driven either by a three h.p. electric motor running



This view shows the full interior of a Mann Egerton container with ceiling trunking.

off the mains when the vehicle is static, or by a Lister diesel engine when the vehicle is travelling on the road, or the container is on board ship. Changeover from electric to diesel drive is by a single switch. Cooling of the container is by forced convection. Two thermostats are fitted, one set at –5° F. enabling deep frozen foods, etc., to be transported, and the other thermostat is set at about 32° F., enabling chilled produce to be carried. The forced convection

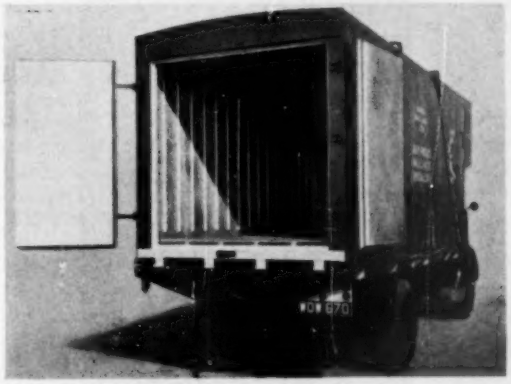
Mann Egerton's 18-ft. lift-off container.

unit automatically starts and stops itself in order to maintain the temperature selected by the operator.

Mann Egerton's 18 ft. lift-off container, is panelled in swaged aluminium and operates on the continuous refrigeration system with evaporator plates. This system can either be plugged into the electric supply at base or operated by an individual petrol engine when on the move. Dual thermostats are fitted, one of these being normally set at about –5° F., and the other at 32° F. The lower temperature is suitable for frozen foods, and the higher temperature for carrying chilled meat, butter or similar commodities.

Egerton's 25 ft. 10-ton semi-trailer is fitted with fully automatic forced convector refrigeration. It is insulated with 6 in. of expanded polystyrene and the capacity is 910 c.ft. It is panelled inside with aluminium and, as you will see, the exterior is panelled in swaged aluminium.

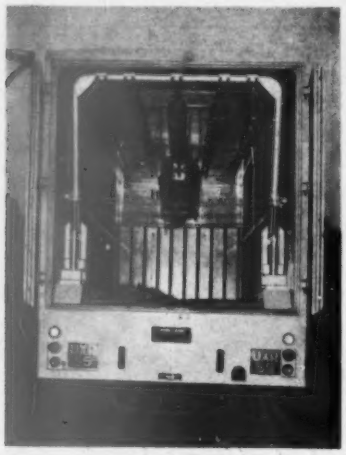
Bonallack Ltd. of Basildon, Essex, have recently built a light alloy, fully-insulated sling container



Habin's sling container and, below, another Bonallack-built truck for the carriage of poultry and eggs.

REFRIGERATED TRANSPORT

For the transport of meat to U.S. Forces in Germany, Bonallack's have built this large capacity vehicle.



Meat van, also shown above, with market loader.

specially designed for Habin Haulage Ltd., Southampton, who specialize in the transport of deep frozen goods. The load compartment which has a capacity of 695 c.ft. is floored in Dekaloy and lined throughout in alloy sheet. The container is mounted on a Bonallack "Standard" flat platform truck powered by a Commer 7-ton diesel.

Another of Bonallack's recent constructions is a light alloy, refrigerated van specially designed for meat transport from Great Britain to the U.S. Forces in Germany. Load capacity is 10½ tons. The roof is fitted with five rails carrying meat hooks, and floored in Dekaloy mark V light alloy flooring with duck boards over. Diesel-electric refrigeration equipment is housed in the rear half of the Luton head, the forepart of this compartment containing a sleeping cabin for the driver. A market loader is fitted at the rear and the vehicle is supplied with additional fuel tanks. An Atkinson six-wheeler L1786T chassis carries this container.

A fully-refrigerated semi-trailer, also by Bonallack's, has a load capacity of 10 tons. Panelled in light alloy sheet throughout, it employs diesel-

Fully refrigerated semi-trailer by Bonallack's.

electric type refrigeration equipment in a special compartment at forepart of body. This compartment is mounted on a BTC W.163/S semi-trailer.

A further example by Bonallack of a light alloy, refrigerated lift container is used for the transport of poultry and eggs. The load compartment has a capacity of 676 c.ft. Refrigeration equipment, which is of the plug-in electrical type with Dole plates, is housed in the Luton extension. A temperature gauge mounted on front bulkhead is visible from the driver's cab. A Ford 7-ton Trader 160 in. wheelbase chassis.

Charles Wensley & Sons Ltd., of Wakefield, produced in 1959 many examples of refrigerated vehicle. The accompanying illustration shows a refrigerated body mounted on a 7-ton, long wheelbase Bedford chassis, with a Primrose 3rd axle fitted. The body

Wensley-bodied 7-ton Bedford vehicle.

Three-ton Bedford chassis carrying a Wensley refrigerated body.

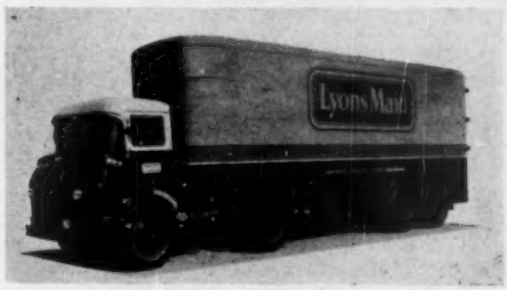
in this particular instance is 23 ft. long. The main framework of the body is constructed from high tensile light alloy. Onazote, with a minimum thickness of 4 in., is used throughout for insulation. The inside of the body is lined with corrugated alloy planking to encourage complete air flow. Constant refrigeration is obtained by an auxiliary compressor driven from the transmission and eutectic plates for holdover, should the vehicle break down, are fitted to the roof of the body. A further condensing unit is fitted and mounted on the front of the body, above the driver's cab. For easy access to the load, three plug-type doors are fitted, one on either side and one at the rear.

A smaller construction, mounted on a four-wheel Bedford, gives a body length of 16 ft.

The next two illustrations depict a refrigerated body mounted on a 3-ton Bedford chassis. The body framing is constructed of best selected hardwood. All framing is treated with wood preservative. The body length is 10 ft. inside. Expanded polystyrene, with minimum thickness of 5 in., is used throughout for insulation. Frigidaire refrigeration equipment and diesel engine for continuous refrigeration are housed at the front end of the body. The rear door is of the super-freeze type and specially constructed with a low step-in for easy access to the load.

A special feature of Wensley bodies is the double framing which reduces conductivity to a minimum.

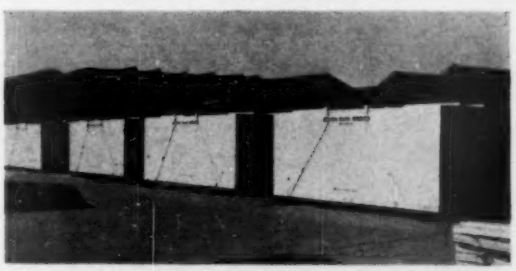
The largest articulated body in Lyons' fleet of insulated transport is this van which is insulated throughout with 6-in. thick Polyzote. Polyzote, made by Expanded Plastics Ltd., of Croydon, is



Lyons' Polyzote insulated van built by Duramin Engineering Co, Ltd.

expanded polystyrene. It is a closed-cell structure and extremely light weight, which makes it ideal for this kind of insulation. This van body was built by Duramin Engineering Co. Ltd.

Another example of a Polyzote-insulated van are these units of a fleet of insulated sling containers for the haulage of meat, built by Marshall Motor Bodies, Cambridge, for British Road Services. They are insulated with 5-in. thick Polyzote, made by Expanded Plastics Ltd., Croydon.



Marshall Bodies for B.R. Services insulated with Polyzote.

Of all the perishable products carried in refrigerated trucks in this country probably ice cream has had most attention devoted to its correct transport. However good the product is when it leaves the factory, quality retention is dependent upon effective refrigerated transport for distribution. Neilsons (Ice Cream & Frozen Food) Ltd., spent a considerable amount of time on this problem. Their insulated bodies are fitted to 3½ and 5-ton vehicles which form part of their distribution vehicle fleet.

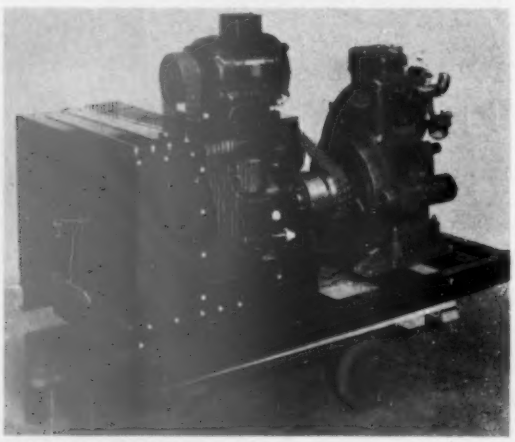
It was decided that the trucks must be provided with correct refrigeration round the clock and jointly the Frigidaire Division of General Motors designed

a power unit based on their standard TD6 condensing unit with both electric motor and a diesel engine as prime movers. The 3-h.p. squirrel cage motor is connected to the 3-phase supply at the depot overnight before the vehicle has started on its journey, and when the truck is on the road a Lister LD.1 single cylinder diesel engine provides the

Refrigerated body, built by Locomotors Ltd., and refrigerated by Frigidaire.

motive power. A centrifugal clutch arranged in conjunction with the two sources of power prevents them both driving the compressor at the same time.

Frigidaire's have supplied a large number of these units, earlier models being arranged as shown

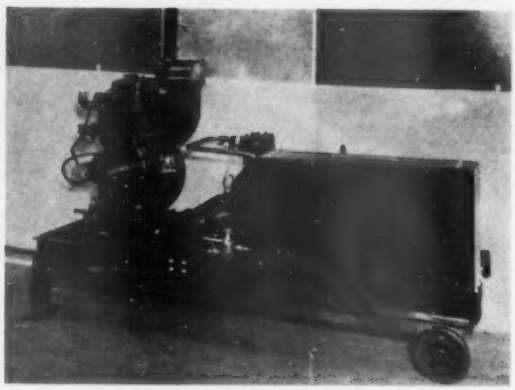


The Frigidaire unit for the van above.

above. Last year they completed an even larger batch of units to a modified design Mk. 11 but based on the same principle and these are illustrated in col. 2.

The 3½- and 5-ton bodies have gross volumes of approximately 350 and 420 c.ft. respectively and are insulated with 4-in. and 5-in. of foamed polystyrene. A small air-lock is provided around the main entrance door which is at the rear of the vehicle. In the original design, nine Winget-Dole holdover plates were arranged on the walls and the roof ; the mk. 11 design employs four Winget-Dole holdover plates having about the same area and thermal capacity. All plates contain a charge of eutectic solution so that sufficient cold is stored up to allow for a short-term emergency.

The power unit is installed at the front of the vehicle body and in the mk. 11 design air for cooling the engine is ducted to ensure efficient cooling of this component. The diesel engines on the mk. 11 units are mounted on a special anti-vibration base designed to eliminate noise and the engine is surrounded by sound-absorbing panels so that the noise level of the complete vehicle is not above that of a normal heavy-duty truck. A wire mesh panel on the side of the

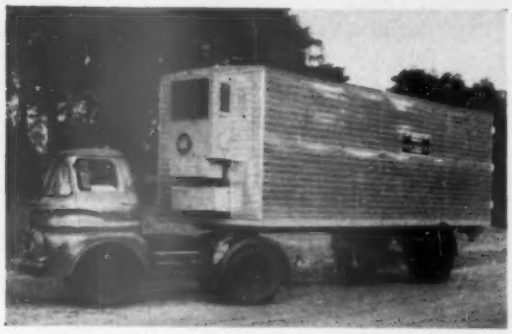


Modified version of the Frigidaire unit.

van and access through a portion of the floor allows for efficient air circulation to carry away the warm air from the condensing unit. The Winget-Dole plates are connected to the system in multiple circuits. Accessibility is of primary importance for servicing and all the controls are brought to one point so that the service engineer can easily reach all valves and switches without it being necessary to get into the compartment to make adjustments.

The equipment is capable of maintaining a temperature of about 0/—5° F. at all times under maximum summer conditions experienced in this country. A thermometer in the driver's cab indicates the air temperature inside the insulated body and the driver can start and stop the diesel engine by means of a switch on the dashboard of the vehicle. A low-pressure switch controls the operation of the compressor when it is powered by the electric motor at night.

Thermo King now in Britain



Mann Egerton container with Thermo King unit.

THE Hawker Siddeley Group have embarked on a programme to supply British and overseas road transport owners with the world-famous Thermo King mechanical refrigeration units, for fitting to vehicles in order to control the temperature of perishable produce in transport.

The need for a suitable, self-contained refrigerator, capable of controlling temperature within close limits, is growing with the rapidly expanding production of frozen foods and ice creams, coupled with the increase in transport of meat, fish, vegetables, fruit, etc.

In the U.S.A. Thermo King Corp., who pioneered the development of transport refrigeration, to-day supply over 90 per cent. of the transport refrigerators sold in the U.S.A.

One of the Canadian companies of the Hawker Siddeley Group started manufacture of Thermo King Units in Canada a few years ago and are successfully supplying that market. They are known as Canadian Thermo Control Co. Ltd.

At Hamble, near Southampton, Hawker Siddeley (Hamble) Ltd. are commencing production of a range of units in various sizes to meet conditions in Great Britain and in the export market.

The Thermo King mechanical refrigerators are self-contained convection units for mounting in the front of the vehicle body by means of a few bolts ; therefore installation takes but a matter of minutes. The drive is by means of petrol engine, electric motor, hydraulic power or a combination of these forms.

The condenser portion with compressor and drive, projects outside the vehicle body, and the evaporator section is self-supported inside where it does not materially absorb load space.

Body temperature is controlled within a few degrees by a thermostat which starts and stops the compressor as required. Automatic defrosting by means of a timing device maintains maximum efficiency and relieves the driver of this responsibility.

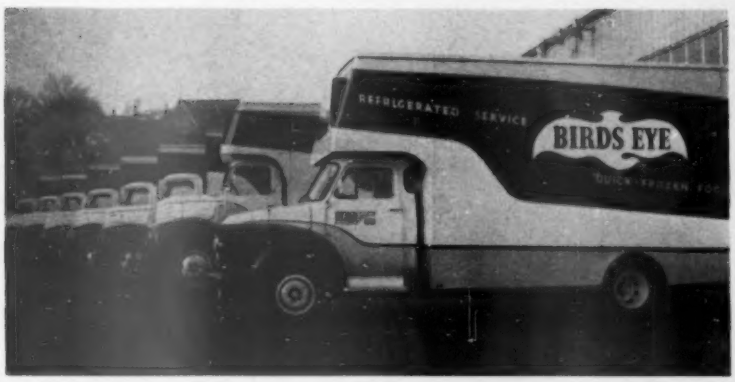
A heating cycle is optional on most units so that body temperature be maintained constant at any point from sub-zero to 50° F., when driving distances through ambient temperature zones that may vary above and below the required produce temperature.

Compactness and light weight are outstanding features of these Thermo King units, which are manufactured with a high degree of precision for maximum efficiency.

Sales in Great Britain are being managed by authorised sales and service distributors who carry stocks and give 24 hours-a-day service. The manufacturers are setting up a service school for training service engineers on the staff of distributors and fleet owners so as to ensure correct routine maintenance.

General manager of the refrigeration division is Mr. J. W. Stagg.

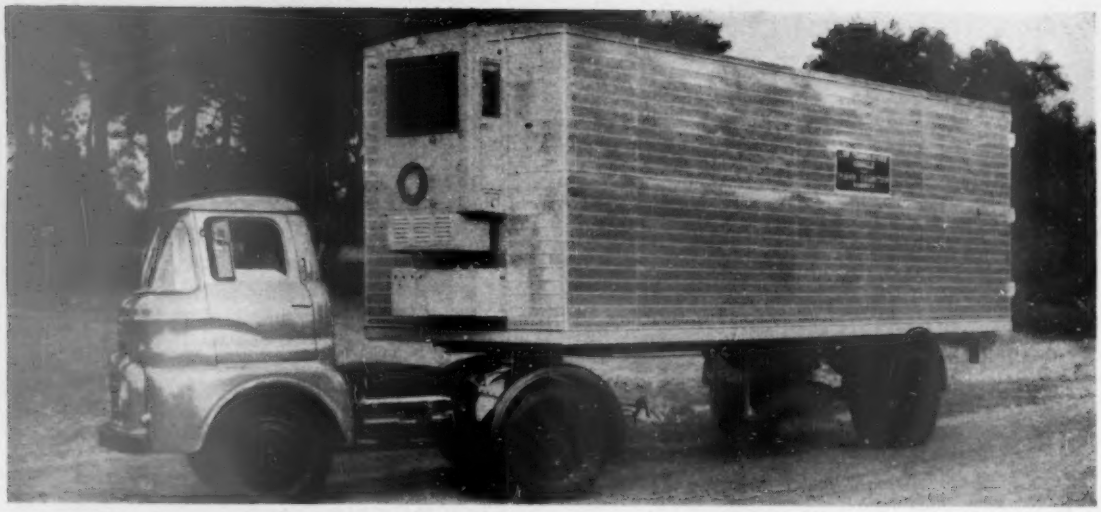
Automatic Plant for Refrigerated Vehicles



Fleet of Prestcold refrigerated vehicles used by S.P.D. Limited who deliver Birds Eye frozen foods.

USUALLY, the great majority of refrigerated vehicles have to be "tailor-made" for a specific duty and set of conditions. Generally, however, they fall into three divisions.

The first one is for fairly constant daily duties. Here the vehicle has holdover plates containing a eutectic solution. The plates are operated by a small condensing unit, mounted in the vehicle but operated by plugging into a mains electrical power supply. Alternatively, similar eutectic holdover plates can be used in vehicles but operated by a condensing unit permanently installed at the central depot. This means reduced weight and increased pay-load for the vehicle, and also that one condensing unit can serve several



Mann Egerton leads once again!

Built by Mann Egerton, and fitted with a **Thermo King refrigeration unit**, this 25 ft. semi-trailer is the first vehicle of its kind be to operated in Britain and will be placed in standard production.

The 10/11 ton semi-trailer has a storage capacity of approximately 1,000 cu. ft. made possible by using the Thermo King unit on the outside of the container.

- Petrol or electrically operated at the turn of a switch—fully automatic.
- Trunking in the container ensures that cold air is evenly distributed over the whole length of the body.
- Temperature can be reduced to minus 20°F. The refrigeration is by forced convection.

Mann Egerton standard refrigerated and insulated vehicles and containers are available in capacities from 7 cwt. to 10 tons.

MANN EGERTON & CO LTD

CROMER ROAD WORKS · NORWICH · TELEPHONE: 47272 TELEX 1710

EXPANDED POLYSTYRENE

SPANDOPLAST

SLAB and SECTION

THE IDEAL INSULATION MATERIAL FOR REFRIGERATED VEHICLES

Manufactured by

THE BAXENDEN CHEMICAL COMPANY LIMITED

CLIFTON HOUSE, 83-117 EUSTON ROAD, LONDON, N.W.1 *Telephone :* EUSton 6140

A Prestcold air-cooled, Super Presmetic condensing unit mounted in a vehicle built by J. H. Sparshatt & Sons Ltd., Portsmouth.

vehicles. Obviously, this is only practical when the vehicles return to the same depot and when the load and journey is fairly similar each day. A third method is the use of holdover plates with a condensing unit operated by power take-off or engine in the vehicle actually during the journey. In the case of the power take-off this is complemented by electrical power when the vehicle is at the depot. This method is useful on widely fluctuating journeys with varied loads.

A good example of this first category is the type of vehicle built by J. H. Sparshatt and Sons Ltd., motor body builders, with headquarters in Portsmouth. They have been notably successful in their development of refrigerated vehicles. Among their customers are such nationally known operators as Smedleys, T. Wall & Son Ltd. and S.P.D. Ltd. who deliver Birds Eye frozen foods.

These vehicles have two great advantages. They have a remarkable degree of thermal efficiency in their insulated body designs and, to quote their sales manager, Mr. A. E. Symonds, "As far as possible we use Prestcold super presmetic units as we have found that these are extremely reliable and constant in output, and of course have the great advantage of being probably the most compact on the market."

Each Prestcold-refrigerated vehicle is fitted with four truck-type holdover evaporator plates containing a eutectic solution solidifying at —12° F. which are one and a half horsepower super presmetic air-cooled condensing units on the vehicle. Eutectic plates use "thermo-storage" to hold steady storage temperatures for long periods even when the condensing unit is not in operation.

After each day's tour of duty the unit is plugged into the power-supply at the vehicle depot and the plates "pulled down" to temperature ready for the following day's journey.

Research and development in conjunction with their customers has led to the production by Sparshatt's of a new and patented frameless stressed skin body construction which they consider to be in advance of any other manufacturer's in this country. It is lighter, permitting a heavier pay-load to be carried and avoids the necessity of a double

Used by the Sheffield Regional Centre of the National Blood Transfusion Service, this vehicle carries blood from donor to bank. The vehicle has Prestcold plant.

framework and ties normally used. In tests in ambient temperatures approaching 90° F. these vehicles came through with flying colours.

In addition to this basic construction considerable attention is paid to detail. Door frames moulded in fibre glass can be wiped clean with the minimum trouble : straps retaining the body within the chassis are of non-conductive material ; floors can be formed in a single waterproof tray so that the interior of the body can be washed with high pressure hoses, quickly and easily with no possible risk to the insulation.

The Prestcold equipment incorporated in vehicles built by Sparshatt's was supplied by Hampshire Refrigeration Ltd., Southampton.

Another interesting vehicle equipped by Prestcold is used by A. J. Linfield Ltd. to transport mushrooms, which are loaded into the vehicle as they are picked, their temperature being reduced to 30° to 42° F. whilst the vehicle is waiting at the growing beds, the cooling being completed during the specific journey.

Obviously there are many more examples of refrigerated vehicles. Notably the Sheffield Regional Centre of the National Blood Transfusion Services uses such vehicles in transporting vital supplies of blood.

Duties, of course, vary considerably for refrigerated vehicles. They range from carrying foodstuffs—at temperatures from zero to 55° F. —to air-conditioning for ambulances. There are many industrial uses, and they are even used for military purposes, some of which are still secret.

NEW COOLING SERVICE FOR TRUCKS

Introduction

ONE of the major problems facing the frozen food industries in Great Britain and the United States to-day is the difficulty of ensuring that their products reach the retail shops in perfect condition.

The Distillers Company Limited, in line with current American practice, have developed a new technique known as the DisChiL food preservation service which represents a major advance in reaching the ultimate aim of constant zero transport temperatures.

DisChiL involves the blasting under controlled conditions of pure carbon dioxide from a receiver into a loaded container through a control jet. This results in the rapid cooling of the container and its load.

Precooling

Mechanically refrigerated vehicles and insulated containers used for the transport of frozen or fresh foods are, of course, designed to minimize the entry of heat during the journey from the supplier to the customer.

In this country, however, we have no enclosed refrigerated warehouse loading facilities. As a result, goods from cold storage are exposed to atmospheric conditions for the entire loading period, which may vary from a few minutes to, in some cases, hours. Similarly, the vehicle itself absorbs a considerable amount of heat prior to loading and this remains in the shell and insulation for a long time. Under normal conditions, tests indicate that it may take up to six hours to gain control of the load using mechanical means or dry ice.

Prechilling of the vehicle before loading using mechanical refrigeration or solid carbon dioxide, chills only the air with little cooling of the interior body shell unless a considerable time interval elapses. Even then, the refrigerated air is lost during the loading period and the body shell again absorbs heat from the atmosphere.

The use of liquid carbon dioxide in the DisChiL process overcomes all these disadvantages. When liquid carbon dioxide is expanded, it removes heat at a very high rate. When it is injected into a vehicle through a DisChiL nozzle, vaporization takes place and results in a covering

The Distillers vehicle about to blast chill an insu'ated food container.

INSULATION

Taylors of Mitcham

"OPINION"

"POPULARITY AND INSULARITY"

Any form of insulation, from sawdust to a pile of old blankets, behaves the same in still air conditions—at first.

There's the rub!

How long will it last? When will you have to reach deep into your pocket to renew and repair the damage done elsewhere?

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★

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Refrigeration unit by L. Sterne & Co. Ltd., powered by a Lister 3 h.p. air-cooled diesel engine.

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for mobile refrigeration units

Lister air-cooled diesel engines provide smooth-running *reliable* power for all types of refrigeration plant, and because of their light weight and compact design are ideally suitable for mobile units. They can be provided with either electric starting or fully automatic control equipment.

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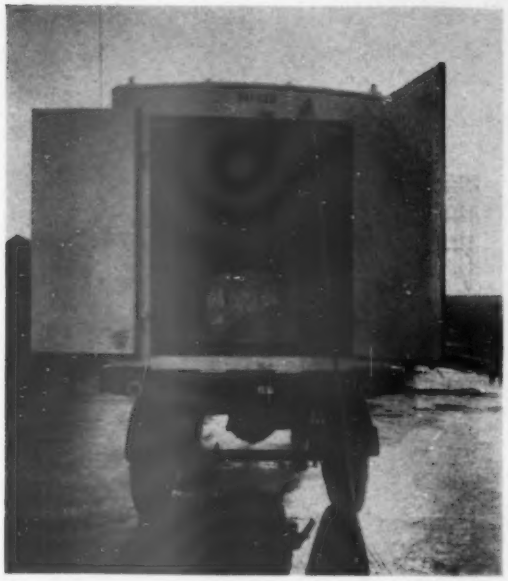

The vehicle is connected for cooling and . . .

of pure CO_2 snow around the walls of the vehicle and its load. The result is :—

1. Removal of heat from interior shell, insulation and load.
2. Removal of interior air and its replacement by cold carbon dioxide gas which provides an atmosphere strongly inhibiting bacterial action and minimizing oxidation.

Control in a Few Minutes

The work of several hundredweight of mechanical refrigeration equipment is thus accomplished in a few minutes, the exact period depending on the duration of the DisChiL injection.

A typical mechanical refrigerator of ½ h.p. evaporating at −50° F. will have a capacity of 650 B.t.u./h ; its weight will be about 130 lb. occupying a space of about 5 c.ft., state Distillers in claiming that DisChiL will carry out this heat removal of 650 B.t.u. in a ½ minute. Moving up the scale of size, a 10 h.p. mechanical refrigerated unit also evaporating at about −50° F. will have a capacity of 15,000 B.t.u./h. The unit would weigh about 1,420 lb. and occupy between 30 and 50 c.ft. A two minutes' DisChiL injection would remove this heat load and in both cases, of course, there are no weight or volume considerations involved.

Method of Operation

DisChiL is most advantageously carried out by installing a ¼-in. nozzle of simple design through a suitable point, say, above the door of a container. Likewise, the air vent can be similarly located. Suitable fittings are freely available for this purpose and their fixing is a relatively easy job although on no account should the nozzle or vent barrel pass through the insulation.

In order to obtain the best possible distribution of cold throughout the load, it is recommended that a free passage around the load of about 1 in. is allowed. Recent D.S.I.R. technical reports show that such a space would undoubtedly benefit frozen foods carried by normal dry ice or mechanical refrigeration systems and it follows that much greater benefit would be achieved if this space was present when using DisChiL, even if a slight reduction in vehicle insulation thickness resulted.

. . . the DCL driver/operator "turns on the cold tap."

Heating, cooling, refrigeration—whatever the application, the medium or the conditions, our expert knowledge of heat exchanger design can save you time and money. Besides supplying S.G. gilled tubing in most metals, we make complete heater batteries, coolers, condensers, evaporators, etc. for every branch of industry. We specialise in "specials", either to your drawings or designed throughout by us to give the figures you require.

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At present, for trial purposes, injection can be made through partially open rear doors although some loss of carbon dioxide must be accepted using this method.

DisChiL supplies are at present carried to the customer's premises by a bulk liquid tanker fleet, each tanker holding up to 9 tons, equivalent to over 2,000,000 B.t.u. refrigeration.

Most of the test runs were carried out by injecting DisChiL through the partially open rear doors with the consequent loss of refrigeration.

Future Developments

Owners of transport fleets are now starting to adapt their insulated containers for DisChiL treatment by fitting suitable nozzles and gas vents. During the coming months, static or mobile DisChiL installations will be set up at major centres in the United Kingdom. Such facilities would enable, for example, a load of meat from Aberdeen, after initial DisChiL treatment, to be recharged at a suitable intermediate point en route to the South of England.

Summary

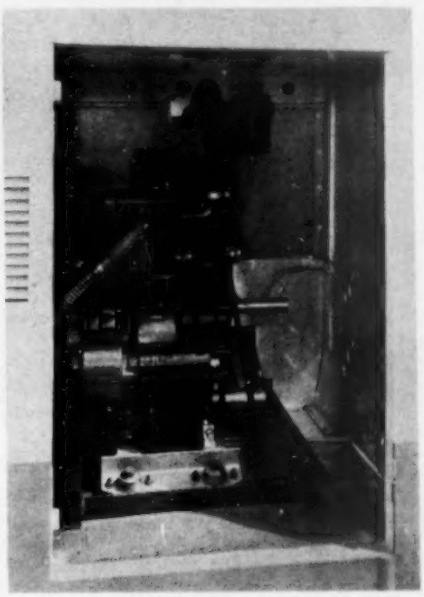
The desired carrying temperature can be instantly established. The vehicle's system of refrigeration whether operated mechanically or by dry ice is only required to maintain the carrying temperature and no large immediate heat removal is required.

DisChiL helps retain the so important fresh killed bloom of beef, pork, lamb, poultry and other meat products. It flushes moisture laden warm air out of the containers and replaces it with cold dry carbon dioxide vapour.

DisChiL results in substantially less dry ice requirements for any particular journey. In certain cases, such as short journeys or with well insulated containers, it may even be possible to dispense with all other refrigeration equipment. Where mechanical units are used, their size can be reduced, life is added to the mechanical units and great savings in fuel and maintenance result.

Where mechanical refrigeration is fitted, DisChiL treatment provides a means of rapid recovery of temperature in the event of breakdown, or after partial unloading.

Five-ton Commer Refrigerated Vehicle held at −5°F.



Soundproofed engine compartment on 4-ton Karrier refrigerated vehicle equipped for Neilsons (Ice Cream & Frozen Foods) Ltd.

Machine-Maker in the field of Refrigerated Transport

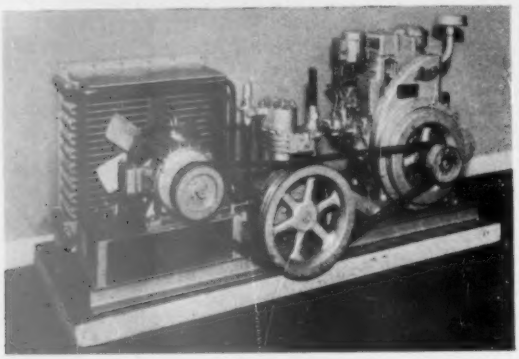
FOR over 70 years L. Sterne & Co. Ltd. have been in the forefront of progress in the refrigeration industry in this country. They can claim to be one of the few companies who can supply from the smallest hermetically sealed motor compressor through the complete size range right up to industrial refrigeration equipment of 600 h.p. and above. All this tremendous experience in refrigeration techniques has been applied to the manufacture of many different types of mobile refrigeration equipment.

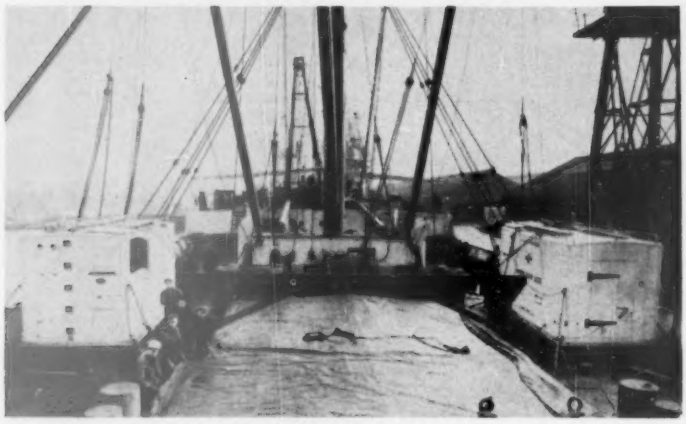
Refrigerated Road Vehicles

L. Sterne & Co. Ltd. offer two basic types of refrigerated vehicles in this field : a reliable and economic vehicle well suited to the good roads of this country, tried and proven in use. Alternatively, for the more arduous conditions experienced in many overseas countries or where the utmost reliability and ease of operation are called for by high-value loads, a new design has been developed based on previous experience and embodying the latest developments in refrigeration and electronic engineering.

This new design employs separate refrigeration circuits, each operated by a hermetically sealed motor compressor unit and all controlled by an electronic panel. This control panel incorporates a transistorized thermostat which dispenses with all moving parts and thus eliminates any effects of vibration which could give rise to uncertain and unsatisfactory operation. The vehicle can be connected to a depot electric supply when this is available, but a self-contained engine-alternator unit is incorporated making the vehicle completely independent in operation. Advantages confirmed in this new design have been protected under a provisional patent. After careful and severe development testing it is hoped that a demonstration vehicle will be available early in 1960.

Equipment of either type can also be supplied for installation in customer's own vehicles by Sterne's





Top left: Sterne's compact diesel/electric condensing unit for refrigerated transport.
Top right: Interior of A.E.C. Mammoth Major refrigerated vehicle for transport of ice cream. Space held at −10° F.
Above left: Refrigerated containers as deck cargo.
Above right: Interior view rail container.

expert installation engineers. A compact diesel-electric compressor unit has been developed especially suitable for home market use, competitively priced and suitable for many different types of installation. In some cases this unit can even be accommodated under the vehicle chassis, thus occupying no valuable load space.

Road — Rail, Rail — Marine Refrigerated Containers

Sterne's have had considerable experience in the manufacture of road—rail, rail—marine refrigerated containers. These units can be manufactured to customer's specifications for all such applications. Alternative refrigerated systems are available to suit almost every type of operating conditions.

Plans have been announced by Mr. W. A. Woodcock, vice-president, **Union Carbide International Company,** for a technical service laboratory for plastics to be located in Geneva, Switzerland. Union Carbide International Company is the division of Union Carbide Corporation responsible for export sales and overseas interests. The laboratory will be an integral part of Union Carbide Europa S. A., an affiliate of Union Carbide Corporation, with headquarters in Geneva, Switzerland. The laboratory will be devoted primarily to rendering technical service to the European plastics industry. It will develop and demonstrate technical know-how, cultivating new end uses for polyethylene within the European market. It will co-operate with plastics machinery manufacturers towards expanding markets for polyethylene.

* * *

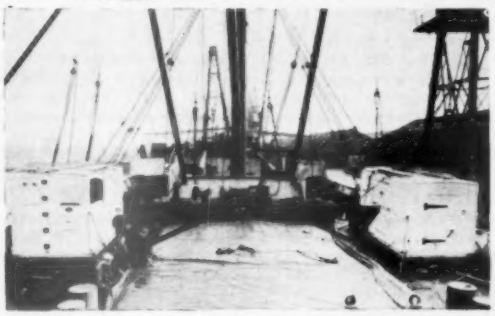
Car Cooling Firms in New Association. Thirteen manufacturers of auto air-conditioning systems have formed an organization to endorse quality products in their field. Association members are A.R.A. Mfg. Co., Cartrol Corp., Clardy Air Conditioning Co., Capitol Refrigeration Inc., Climatic Air, Forston Co., Frigikar Corp., Frigiquip Corp., International Auto Air Conditioning, Industries, Inc., John E. Mitchell Co., Parkomat Mfg. Co., and Eaton Mfg. Co.

REFRIGERATED TRANSPORT

by STERNE

10-ton capacity refrigerated meat transport vehicle for Iran operating at —10°F.

Refrigerated milk transport vehicle operating at 40°F.



Refrigerated containers for rail and marine transport operating at —10°F.

A —10°F refrigerated vehicle for the transport of 3,500 gallons of ice cream.

Sterne refrigerated vehicles and containers operating at temperatures from —10°F to 40°F are in use at home and overseas for the safe and reliable transport of perishable goods. The refrigerating equipment is driven from the mains supply in the depot or by a diesel engine when on the road.

EQUIPMENT SUPPLIED AND INSTALLED FOR ALL TYPES OF REFRIGERATED TRANSPORT

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CARDIFF	Cardiff 26408	**BELFAST**	Belfast 59211	**AYR**	Ayr 66094
		DUBLIN	Dublin 71316		

REFRIGERATED TRANSPORT

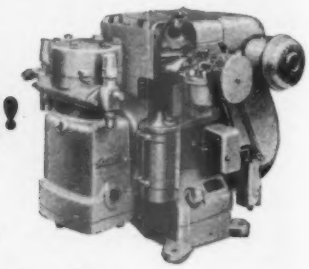
Mrs. J. R. Parratt, wife of the chairman of Birds Eye Foods Limited, approaching the loading bank of the new BE store at Kirkby, Liverpool, which she opened towards the end of 1959. Mr. J. R. Parratt (hatted) is to be seen in the picture. In the background are to be spotted two types of transport for Birds Eye foods.

New Van on South Coast

Mark III version of the refrigerated van already described in these columns. Built by W. A. Taylor Limited of Mitcham and operated by Southern Frozen Products Limited of Brighton, it is suitable for van selling or bulk delivery. The great advantage over previous models in this range is the ground level entry at the rear; Taylor's special air-lock door is retained. Self-contained refrigeration plant is incorporated in the layout.

NEW IN BRITAIN!

ONAN
Packaged Engine-Compressors



The only refrigerator - compressors directly coupled to the engine

Here is the answer to mobile refrigeration and air conditioning when electricity is not a practical source of power. The ONAN Packaged Engine-Compressor is controlled directly from the driver's cab so that the driver can watch a temperature dial and switch on the compressor as necessary. This is a big advance over standard van equipment where the compressor runs without stopping throughout the entire journey.

UTTERLY DEPENDABLE LONG LIFE ONAN ENGINE incorporating rotating stellite exhaust valve and renewable stellite valve seat insert, which greatly extend the period between decarbonisation. Large oversize main bearings. Pressure lubrication by oil pump.

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TRADE MARK REGD.

BRASS MONKEY PRODUCT

MORE COMMERCIAL NEWS

Mr. K. A. Wood, a director of **Southern & Redfern (Frigidaire) Ltd.**, Leeds, has been installed with the badge of office as the new president of the Northern Poultry Society in succession to Mr. J. L. Whittingham, of Bingley. The ceremony took place at the annual show at Harrogate recently.

* * *

Adams Brothers & Burnley Ltd., of Elmgrove Road, Harrow, Middlesex, have issued an attractive, illustrated brochure on their activities. They state "The business that comes our way normally starts as production work which manufacturers cannot conveniently handle themselves, or as experimental jobs for big manufacturers. Frequently, however, this has developed into regular, large-scale contracts for the production, assembly, packing, and despatch of complete units. To date, we have served mostly the automobile, electrical and domestic appliance industries. The advantages of this type of arrangement to our customers are, of course, considerable."

Type of movable frozen food case now popular in U.S.A. for peak-hour trade; this one is made by the Star Cooler Corporation.

Refrigeration Patents

These new refrigerating patents have been specially selected for readers by MODERN REFRIGERATION from the official "Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office.

APPLICATIONS RECEIVED

November 5—Vilter Manufacturing Co., C37492, Flake ice making machine. 6—Erb, A. C. J., C37652, Refrigerators. 11—Licentia Patent-Verwaltungs G m.b.H., C38258, Refrigeration apparatus. 19—Ruchpaul, K., P39322. 20—Denco Miller Ltd., Miller, A. S., P39478, Refrigeration equipment. 23—General Motors Ltd., Phillips, R. V., P39632, Refrigerator.

COMPLETE SPECIFICATIONS ACCEPTED

November 18—Electrolux Ltd., 826,511, Absorption refrigerating apparatus. 25—Gascoignes (Reading) Ltd., 826,734, Apparatus for cooling liquids in bulk. December 9—General Motors Corporation, 827,102, Refrigerator cabinet.

REFRIGERATE AS YOU DRIVE!

The ultimate in Frozen Food Sales and Distribution

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CENTRAL COACH WORKS, INGS ROAD, WAKEFIELD.
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FRIGIDAIRE'S 1960 DOMESTIC MODELS

INCREASED capacity, larger and even colder frozen food compartments, more shelf space, clean, crisply styled exteriors—these are some of the new features included in the 1960 range of Frigidaire refrigerators just announced by Frigidaire Division of General Motors Ltd. Altogether seven models are announced, ranging from 3·4 c.ft. capacity to 10·1 c.ft. capacity. In spite of these additional features, prices of all cabinets remain the same as in 1959.

MA-34T Master Model 3·4 c.ft. Gross Capacity

Only 21 in. square and 36 in. high, the MA-34T not only has an increased cubic foot capacity, but also has an increased food shelf area which is now 7·7 sq. ft. The principal feature of the new 3 c.ft. cabinet is the large super-freezer which has been considerably increased in size and in addition to storing nearly 7 lb. of frozen food, now also contains a sizeable separate compartment for the storage of ice cubes. Shelving, as in all the new Frigidaire models, is adjustable and all shelves have an attractive anodized golden front trim. In addition, the top shelf has been designed with an open side under the chill tray which enables the shelf to be reversed, when required, to allow for easy storage of very tall bottles on the shelf below. To help the housewife store everyday things, such as eggs, milk, butter, fats and sauces, in a position where they can be conveniently placed and easily removed, the door store has also been enlarged and, in addition to a top rack for storing eggs, it contains two lower shelves for the storage of packets and small and large bottles, especially milk. The housewife will find these refrigerators very easy to keep clean and the porcelain-on-steel table top a great boon. The MA-34T is available with left- or right-hand door openings and is suitable for building in. With a colour-cool interior of light blue and dark green, it is also available in a choice of five exterior colours, Olympic red, Mayfair pink, Sherwood green, Cotswold cream or Snowy white. Price of the MA-34T is 55 gn.

The large super-freezer for the storage of frozen foods and ice making is a feature of the 1960 Frigidaire model MA-34T. Only 21 in. square and 36 in. high, this model not only has an increased cubic foot capacity but also has an increased food shelf area of 7.7 sq. ft.

A large super-freezer which will store 11 lb. of frozen food for 3 to 6 months, depending on the type of food, is a feature of this 1960 Frigidaire 4.6 c.ft. refrigerator, model DA-46T.

MA-45T Master Model 4·5 c.ft. Gross Capacity

Shelf space of this model is 8·6 sq. ft. and the shelving is adjustable. The super-freezer takes nearly 8 lb. of frozen food. Suitable for building in, this model, which

also has the new colour-cool interior, is available in cream or white exterior colours. Price 65 gn.

DA-46T *De Luxe* **Model 4·6 c.ft. Gross Capacity**

Principal feature of the new *de luxe* " Four " is the super-freezer which has been considerably enlarged and specially designed so that it is now capable of storing frozen food for three to six months depending on the type of food. This is a feature hitherto confined to the freezer chests of the large *de luxe* cabinets. Altogether 11 lb. of frozen food can be stored in this super-freezer and in addition there is a separate compartment for quick ice-making. In this model, too, the shelf area has been increased to 9·9 sq. ft. and it has the reversible top shelf for extra tall bottles. A new feature of the door store is the full width cheese and butter compartment and the enlarged lower shelf which is suitable for storing milk and other bottles. With an interior light, a " Hydrator " for fruit and vegetables and a colour-cool interior of white, light blue and pearlescent dark green, this cabinet is also available in five exterior colours. Available with left- or right-hand door and suitable for building in, the DA-46T is priced at 72 gn.

MZ-84 Master Model 8·3 c.ft. Gross Capacity

The MZ-84, with adjustable shelving, full width " Hydrator," and four shelves and a butter compartment in the door store, provides a total shelf area of 15·9 sq. ft. Frozen food capacity in the super-freezer is 12·9 lb., and the door store shelves have been so designed that they accommodate both milk bottles and long hock bottles and 16 eggs. All interior fitments can be easily removed for cleaning. Interior colours are in the Frigidaire colour-cool contrast. The MZ-84 is available in all five exterior Frigidaire colours and, in common with all the new 8 and 10 c.ft. Frigidaire cabinets, is now provided with a door lock. Price : (including purchase tax) 113 gn.

DZ-84 *De Luxe* **Model 8·4 c.ft. Gross Capacity**

Even more frozen food can now be stored in the new style super-freezer chest incorporated in the DZ-84 refrigerator. This full width low temperature freezer will now accommodate 46½ lb. of frozen food for periods of three to six months, dependent on the type and conditions of the food on entering. Small quantities of home grown produce can be frozen and stored for a similar period. Adjustable shelving and a full width " Hydrator," together with a comprehensive door store similar to that in the MZ-84, are additional features which together provide 16 sq. ft. of shelf area. The DZ-84 with the colour-cool interior is sold in a choice of five Frigidaire exterior colours. Price : (including purchase tax) 125 gn.

MZ-101 Master Model 9·9 c.ft. Gross Capacity

The MZ-101 has a total of six interior shelves as well as a full width " Hydrator " and possesses what must be one of the most comprehensive door stores ever built into a domestic refrigerator. Two bottle shelves and two egg racks have removable shelf fronts ; one of the bottle shelves has a fluted background for bottle security, and even the tallest bottles can be accommodated. In addition there are cheese and butter compartments which, together with the shelf fronts, are finished in the new pearlescent dark green contrast colour. The super-freezer holds 20·7 lb. of frozen food, and the total shelf area is no less than 18·7 sq. ft. The MZ-101 is available in all five Frigidaire colours. Price : (including purchase tax) 145 gn.

1960 Frigidaire 10.1 c.ft. refrigerator, model DZ-101, which combines shelf space of 18.3 sq. ft. with a frozen food capacity in the insulated super-freezer chest of 46½ lb.; herein frozen food can be stored for periods of 3 to 6 months and small quantities of home-grown produce can be frozen and stored for a similar period.

DZ-101 *De Luxe* **Model 10·1 c.ft. Gross Capacity**

Real refrigerator luxury is to be found in the DZ-101, which combines shelf space of 18·3 sq. ft. with frozen food capacity in the insulated super-freezer chest of 46½ lb., to give maximum planned storage space. As with the DZ-84 small quantities of home grown produce may be frozen. In the refrigerator itself there are five fully adjustable, plastic covered, anodized trimmed shelves ; in the door, butter and cheese compartments, two egg racks and two shelves for bottles—these are just a few of the many features. As with all the new Frigidaires, the streamlined exterior and the colour-cool interiors add that finished touch of quiet richness. The DZ-101 is available in any of the five Frigidaire colours. Price : (including purchase tax) 158 gn.

Refrigeration Unit

The Frigidaire " Meter-Miser " rotary compressor powers all Frigidaire models. It is warranted for five years,

SMITHS

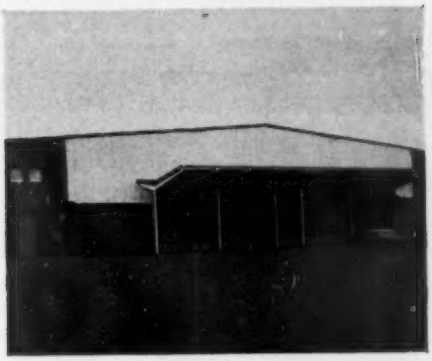
build two of the country's greatest cold stores!

This recently completed 575,000 cu. ft. frozen foods store at Kirkby Trading Estate, Liverpool, for Birds Eye Foods was designed and built by Smiths and incorporates a 500 ft. canopy-covered loading bank among its many refinements. The totally unobstructed interior is finished in Polar White with granolithic floor, and entry is by super-freeze doors fitted with heaters to prevent ice formation.
Once again, Smiths revolutionary construction techniques have produced a permanent store allowing maximum storage space and easy handling of stock.

The handsome exterior of the new cold store at Kirkby Trading Estate, Liverpool, for Birds Eye Foods Ltd.

The single-span interior showing the pallet layout.

The entire insulation of this huge 600,000 cu. ft. store at Gloucester for T. Wall & Sons (Ice Cream) Ltd. was entrusted to Smiths. Cork was used throughout for the insulation with 12 in. on ceiling, walls and floor. Cooling is by air coolers in their own compartments, there being 10 in all. Air distribution ducting is fitted across the ceiling. The walls were lined with Polar White Cement and the floors finished with granolithic. Once again the prefabrication technique was used and the Minikay system installed.



Offices, Staff Rooms and toilets etc. are provided at this new cold store for T. Wall & Sons (Ice Cream) Ltd. at Gloucester.

The interior of the store which is designed to operate down to -20° F.

Smiths should build your new cold store

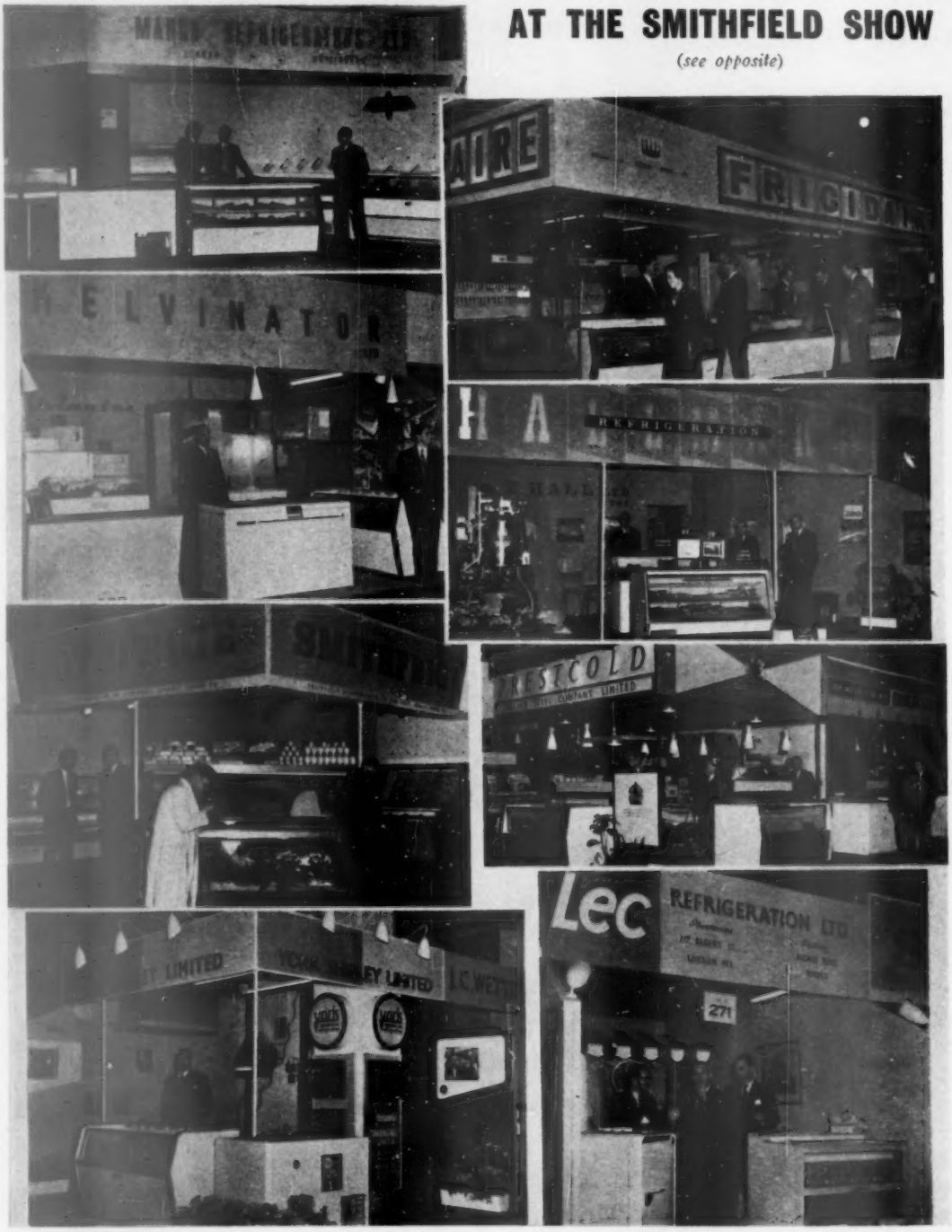
Smiths Insulations Ltd.

Est. 1874 **Burton-on-Trent** **Tel: 2061/2**

London Office:
105 Empire House,
St. Martins-le-Grand, E.C.1
Tel: MONarch 2000

AT THE SMITHFIELD SHOW

(see opposite)



The Smithfield Show

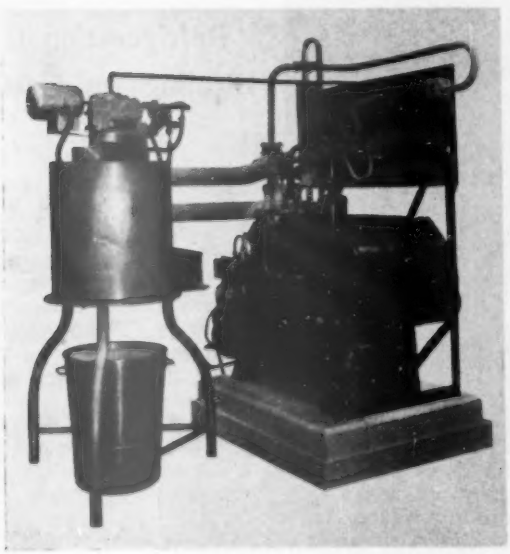
REFRIGERATION FIRMS WELL REPRESENTED

AT last month's Smithfield Show, staged by the committee appointed by The Smithfield Club (Incorporated), The Agricultural Engineers' Association and The Society of Motor Manufacturers and Traders, Ltd., at Earls Court, London, eight major refrigeration firms displayed their products.

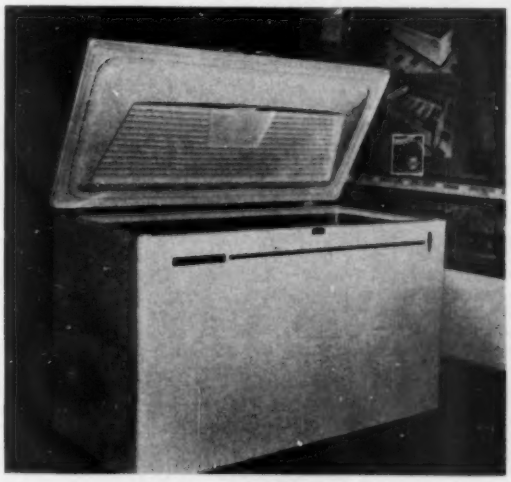
Refrigerated display was the main theme of the **Frigidaire** stand. Altogether seven pieces of display equipment were on show ranging from the Frigidaire Manhattan self-service display case, to the 4 ft. counter top unit, model AOD-6, specially designed for the small retailer. Among these cases were display units suitable for fresh meat, provisions and frozen food. Being exhibited for the first time was a new frozen food display case, model AGF-136, a 6 ft. glass-fronted low-temperature case with a net storage capacity of 13·6 c.ft. Also being shown in public for the first time was the Frigidaire " Zero-Store," an upright frozen food storage cabinet combining a number of features designed to provide simple, convenient and speedy use of frozen foods in the catering kitchen or shop store area. Built to give maximum storage space while occupying minimum floor area, the "Zero-Store" stands 6 ft. 3 in. high with a base measurement of only 2 ft. 7 in. by 2 ft. 9 in. and will hold at least 500 lb. of packaged frozen food at 0–5° F. in ambient temperatures of up to 90° F. Both capacity and shelf area of the new cabinet are generous, net volume being 16·8 c.ft. and usable shelf area 24 sq. ft. Front access to the frozen food through two doors makes the cabinet easy and quick to use and the provision of eight separate shelf compartments not only ensures simple stock control but also facilitates the storage of a wide variety of frozen foods. In addition to cold rooms, electrical defrosting units and ice cream and frozen food conservators, Frigidaire exhibited their new 7½ and 10 h.p. water-cooled condensing units. These were on public view for the first time since they were introduced at the end of November.

J. & E. Hall Ltd. featured their Col-Flake ice-maker (standard display model) complete with 6CPM Hallmark machine together with tank for ice disposal. The plant is capable of producing 1 ton of ice per day. Other items of equipment on this stand were a 4 ft. frozen food cabinet (Lec model G.S.71) ; a self-contained, three-quarter vision display counter model S.C.16 (Lec R.C.6) ; a Winget Crystal cooltop together with sealed unit ; a model hydrocooling plant ; two Hallmetic sealed units ; a 6C compressor block ; and 3¾ in. by 3 in. six cylinder veebloc machine.

Hall's ice-maker.



Kelvinator's starred their model KCJ-20 home freezer 19·6 c.ft. capacity (686 lb.). Space-engineered design to give maximum food storage in minimum floor space, this compact design permits the freezer to be moved through door-ways as narrow as 28 in. Its 4-wall cold enables fast freezing to be achieved anywhere in the food compartment. The wrapper-type condenser eliminates sweating, noise, dirt and service from the cooling fan while two removable compartment dividers and four removable storage baskets make for greater storage flexibility. Further features are an interior floodlight ; safety signal light ; safety lid latch and lock ; positive seal flexible lid.



Kelvinator's new home freezer.

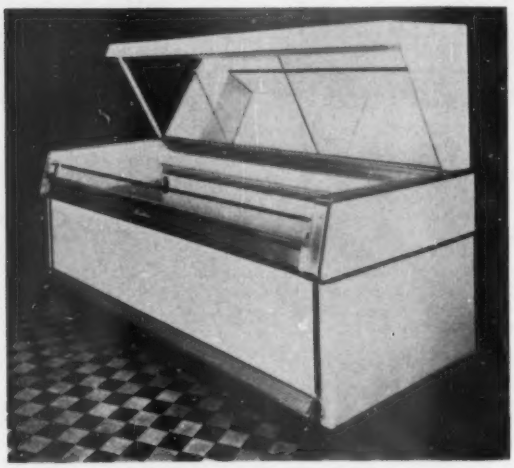
Lec Refrigeration Ltd. showed the following plant : The P.20, new Coronet, domestic cabinet of 2 c.ft. capacity ; the P.60, new International domestic cabinet of 6 c.ft. capacity ; the CF.25, home freezer of 5·4 c.ft. capacity ; the CF.50, Universal freezer of 12 c.ft. capacity ; the C.9, ice cream and frozen food conservator 3 c.ft. ; the CD.35, dual-purpose display ; the RC.6, three-quarter vision display ; the GS.91, Super Salesman display and the B.13 bottle cooler of 13 c.ft. capacity.

Marco Refrigerators Ltd. showed a number of new models. Firstly, there was a pair of new Marco conservators. These are MC.55 and MC.1125 of 5½ c.ft. and 11½ c.ft. capacity respectively. These are especially suitable for ice cream and for the storage of dairy produce and frozen foods. There were also three new frozen food cabinets. These are, firstly, the Marco " Salesmaker," which is similar in general appearance to the " Marquis " cabinet, but with completely revised and improved refrigeration, and increased capacity. Medium and low temperature models of the " Salesmaker " were shown. The second of the frozen food display cabinets was the " Californian," shown in a 6 ft. length. The last new model which was displayed was the new " M "-Line cabinet. Manufactured in medium and low temperature models, the " M "-Line is intended for the supermarket and large grocery establishment and also very suitable for the smaller business which has room to expand. Units are remote, and the cabinets

can be placed end-to-end so as to make a display of any length and colours can be arranged to suit the particular store in question. The advantage of the " M "-Line is that the cabinets installed can be added to and the new one will match those already *in situ*. Two of Marco's previous models were also shown, the counter top display case and the " Woking " counter/display cabinet, both of which have proved extremely popular with butchers. These are continuing in production with detailed improvements.

Two new items of refrigeration equipment made their debut on the **Prestcold** stand. They were the new, extremely compact condensing unit of four horsepower. This is a Super-Presmetic, direct-coupled, hermetic unit, which is capable of field servicing. Features include water-jacket cooling of the motor-compressor, and a new *de luxe* version of the famous " Farmoor " frozen-food sales and display case which is fully automatic and self-contained in every way. In addition, the existing Prestcold range was well represented. A 150 c.ft. " Cleanline " cold-room, operated by a quarter-horsepower condensing unit indicated the progress made in the industry towards increasing the ratio of internal storage space to external dimensions. For retail sales and display there was a considerable selection of equipment on show ; the " Retailer " for frozen foods ; the 6-ft.-wide version " Parade " case for prepacked meats ; the standard " Farmoor " ; the " Selserva " counter top for refrigerated display in the window or on top of the counter ; the " Selserva " display case, a complete refrigerated shop only 6 ft. long, for displaying meat, dairy produce and frozen foods ; the " Amara " meat counter which gives cold storage of meats up to the moment of sale ; the " Three-quarter view " display case in which meat displays are completely protected as the customer is served. Two service cabinets were exhibited ; a 14 c.ft. model, streamlined for the shop, to hold pies, prepared orders, etc. and frozen food, and a larger cabinet of 17·3 c.ft. capacity, ideal for hanging poultry, ham, etc. and for general storage. There were also two low temperature conservators displayed, one of five and one of 10 c.ft. capacity. An item of equipment steadily gaining in popularity is the home freezer for quick-freezing and storing home-produced food. The model on show, the " Prestofreeze Senior " home freezer, has a 10½ c.ft. gross storage capacity.

The Smithfield Refrigerator Co. Ltd. displayed the full range of Smithfrige-McCray Koldflo self-service cases, as described in the December issue of MODERN REFRIGERATION. Illustrated here is the M8—a fresh meat cabinet which has



Smithfield's M8 cabinet.

a high display level and a low front, enabling shoppers to see the contents from a distance. Controlled circulation of refrigerated air maintains the right degree of humidity while a warmed reach-in rail ensures customer comfort.

York Shipley Ltd. showing for the first time at this event since the war, exhibited a representative selection from their extensive range of condensing units for Refrigerant-12 and Refrigerant-22. This includes belt-driven models, both air and water cooled, and compressor units for use with a remote condenser. The " Yorkometic " range of hermetically sealed units, both air and water cooled, were also to be seen. Examples from a wide range of unit coolers and a demonstration model of the " Yorkometic " H.G.D. cooler, utilizing the hot gas system of automatic defrosting, was included, together with a 6 ft. refrigerated self-service display counter, operating at 28° F. to 32° F., and a low temperature cabinet for the storage of joints, cuts, frozen foods, etc.

Refrigeration at Birmingham Cattle Show

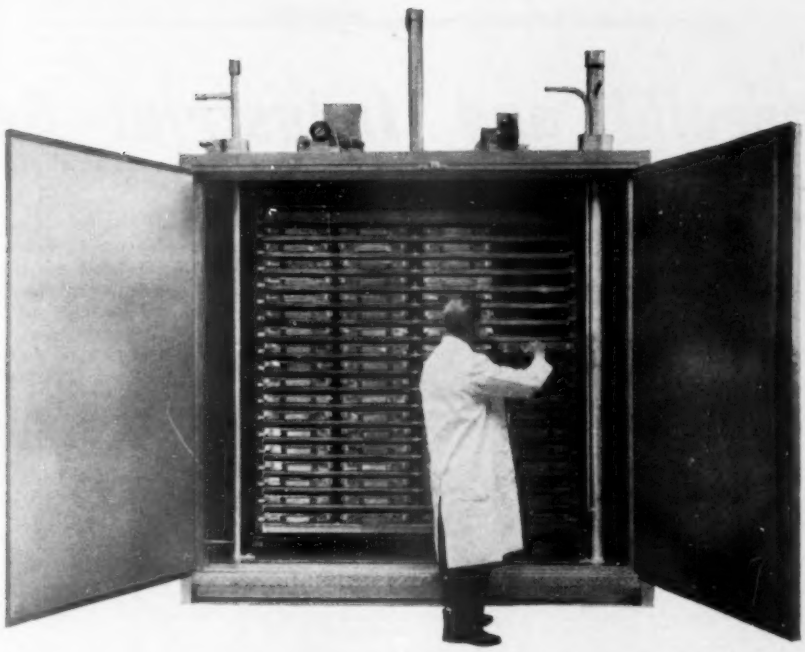
CARTER Refrigeration and Air-Conditioning Ltd., once again took a stand at the annual exhibition of the Birmingham Cattle and Poultry Show. On the stand were displayed a representative range of refrigerating equipment for the butcher and self-service shop; a special 18 ft. 6 in. multi-purpose display counter to be installed at the Bridgnorth branch of Palethorpes Ltd. occupied the centre of the stand. This consisted of a 6 ft. moving air automatic defrosting frozen food section, a 7 ft. 6 in. display for fresh meat and 5 ft. display and storage for dairy produce, with separate Tecumseh sealed condensing units to each section.

Self-service equipment on display and all made at

FASTER Freezing!

Jackstone MODEL "A" 18 STATION

DOUBLE CONTACT PLATE FREEZER



12 TONS

THROUGHPUT every twenty-four hours

GRIMSBY 57321

Jackstone Froster Ltd.

GRIMSBY ENGLAND

FULL DETAILS CAPACITY AND PERFORMANCE ON REQUEST

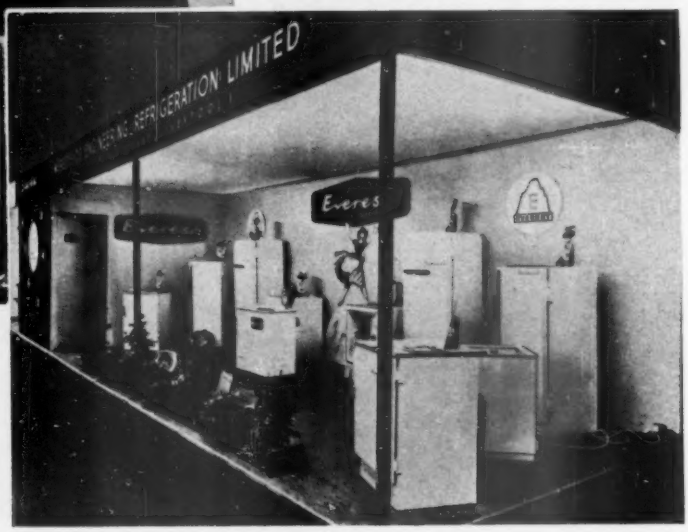
A NEW Jackstone FROSTER

Carter's factory in Birmingham, included an 8 ft. four deck display counter attractively dressed by George Mason Ltd., and a 6 ft. " Airflow " SS4 self-service cabinet.

At the front of the stand were two items of considerable interest to many for the retail butchers who visited the show. The first was a Carter " Open-Vision " refrigerated window display unit, designed to give a wide display of meat with easy access. The second item consisted of a special 10 ft. display and storage counter with " eye-level " display and provision at each end of the back shelf for scales and wrapping paper. This is one of several to be installed in the butchery section of the new Wolverhampton Retail Market. This counter was dressed with a complete range of the cooked goods manufactured by the Epicure Ham Co. Ltd. of Pershore.

Other items of interest on the stand included a range of Sternette frozen food cabinets, the Carter " Everest " automatic defrosting cold room with rustless metal interior and exterior, a deepfreeze cabinet and a 30 c.ft. " Tallboy " service cabinet.

Commercial and Industrial Section



Executives of Merseyside Engineering (Refrigeration) Ltd., discuss their "Everest" products with the Mayor and Mayoress of Harrogate at the Harrogate Trade Fair: Left to right—R. R. Barker (marketing manager); the Mayoress; C. A. Angelis (managing director); the Mayor; K. W. Parratt (Yorkshire area manager); J. J. Ross (sales director).

HARROGATE TRADE FAIR

Merseyside Engineering (Refrigeration) Ltd. exhibited the "Everest" range of domestic electrical appliances and report tremendous success at the above exhibition. Orders received total half a million pounds with further orders in final negotiation. Although visits were made by wholesalers throughout the country it was essentially a show for the Yorkshire wholesalers, which makes the volume of business received highly impressive.

* * *

In connexion with the Perkins/Douglas merger, mentioned last month, it is reported that Mr. W. S. Douglas will be the chairman of the new subsidiary and Mr. T. E. M. Douglas the managing director. Other directors to be appointed are Mr. L. G. Collins, Mr. A. I. Baker and Mr. N. Mountain. Douglas is the fourth company to be acquired recently by the Baker Perkins Group. Last year Steele & Cowlishaw Ltd. (Stoke-on-Trent), Yates Plant Ltd. (London) and Packman Machinery Ltd. (Twyford) became members of the group.

* * *

New equipment materials and methods offered by **Jablo Plastics Industries Ltd.**, in the foamed insulation field, marketed under the trade name, Jablinsul, should be of great benefit to contractors and the building industry for all indus-

trial, commercial and domestic buildings. The insulation material is directed through the nozzle under air pressure into the most awkward corners and it penetrates everywhere in this form which hardens after 20 to 30 minutes.

* * *

Shell Chemical Co. Ltd. and O. & M. Kleemann Ltd. announce the termination as from January 1, 1960, of the agency agreement under which O. & M. Kleemann's subsidiary, Erinoid Ltd., markets polystyrene manufactured by Shell Chemical's associate Styrene Products Ltd. It is also announced that Erinoid will no longer act as agents for the sale of Ziegler polyethylene manufactured by Shell. From the above date, Shell Chemical will be marketing identical grades of polystyrene under the trade mark " Carinex " through its regional marketing organization, and continuing the marketing of " Carlona " high density polyethylene. Erinoid will continue to sell both its own manufactures and its own grades of polystyrene and polyethylene. The arrangements under which Styrene Products Ltd. manufacture polystyrene for Kleestron Ltd., another Kleemann subsidiary, remain unchanged.

* * *

Mr. R. A. Bennett and Mr. A. Cherrill were recently invited to inspect the new Herion factory at Stuttgart, Germany. Resulting from this event has been the conclusion of an agreement whereby **R. A. Bennett & Co. and Refrigeration Spares Ltd.** handle the distribution of the Herion range in the United Kingdom. Herion are Germany's largest producers of driers, filters, sight glasses, solenoid valves, water valves, line valves, mercury actuated thermostats and pressure switches, etc. Also a wide range of controls for hydraulic, pneumatic and automation installations. Initial stocks covering all popular lines were ordered and will arrive early in 1960.

* * *

Two top executives of the Prestcold Division of Pressed Steel Co. Ltd., Oxford, visited the U.S.A. and Canada recently. They are **Mr. T. D. Hinton,** director and deputy general manager, and **Mr. H. J. Edginton,** export sales manager, of the Prestcold Division. Their two-weeks tour of Canada and the United States included visits to Winnipeg, Detroit, Chicago and Pittsburg. The object of the visit was to investigate and increase exports of Prestcold equipment.

Mr. T. D. Hinton (right) and Mr. H. J. Edginton about to board their plane at London Airport.

Arthur Brand Refrigeration Limited, Plymouth

WHEN Mr. Arthur Brand commenced in business at Mutley Plain, Plymouth, more than 50 years ago, little could he have anticipated the phenomenal growth of the refrigeration business he was to develop.

This year marks another important milestone in the history of Arthur Brand Refrigeration Ltd., for Mr. C. H. G. Cutts, after 31 years' service with the company, has left his managing director's chair to be succeeded by Mr. E. W. Harrison from York Shipley Ltd.

Mr. Cutts will shortly be departing for the United States where he expects to reside for at least a year, with the intention of acquiring the latest information on the current trends and practice in the design, manufacture and marketing of refrigerating equipment. At a recent staff gathering tributes were paid to Mr. Cutts for the part he has played in the development of the company, and to Mr. Ron Trebilcock as the employee with the longest association, 27 years, fell the honour to present a gold pen to Mr. Cutts, as a token of the esteem and affection of the staff.

The whole gamut of domestic, commercial and light industrial refrigeration is covered by Brands in the counties of Devon and Cornwall. As the distributor for Hussmann British Refrigeration Ltd., they not only aim to sell refrigerated display, but to give a service to retailers, advising on cabinet location, store lay-out and lighting, as part of their normal function. In fact, they claim to have been largely responsible for the design, décor and layout of the majority of the self-service stores in the west country.

This is only part of their activity, for as the distributor for York Shipley Ltd., Brand's are able to meet the needs of any commercial refrigeration requirement with a range

COMMERCIAL & INDUSTRIAL

Mr. E. W. Harrison, director and general manager, Arthur Brand Refrigeration Ltd.

Mr. C. H. G. Cutts (centre) receiving farewell present from R. W. Trebilcock, director and sales manager (A. Brand Refrigeration Ltd.).

of York equipment from 1/5th h.p. to 15 h.p. capacity. Prominent in recent years among the larger installations, has been their work in beer cooling, poultry freezing, fruit and vegetable storage, sub-zero applications and meat chilling and storage.

Having taken over as director and general manager on Jan. 1, Mr. E. W. Harrison, with 28 years' service in the refrigeration industry, is well known in refrigeration circles. A corporate member of the Institute of Refrigeration and an active member in the past in British Refrigeration Association affairs, Bill Harrison was for several years commercial sales manager for York Shipley Ltd., before settling in the west country as commercial, south-western manager, to complete an association of 25 years with York, an association of which he is justifiably proud. In the latter capacity he worked closely with the York distributor, Arthur Brand Refrigeration Ltd., and is therefore far from being a newcomer to the company.

In support of Mr. E. W. Harrison are Mr. R. W. Trebilcock, sales manager and a recently appointed director of the company, and Mr. R. Rawlings, chief engineer, responsible for applicational engineering, installations, and under the supervision of service manager, Mr. W. A. Martin, field maintenance and workshops. With the experience of this managerial line-up backing a keen team of salesmen, engineers and administrative personnel, Brand's have a strong organization to fulfil the comprehensive functions of a refrigeration distributor.

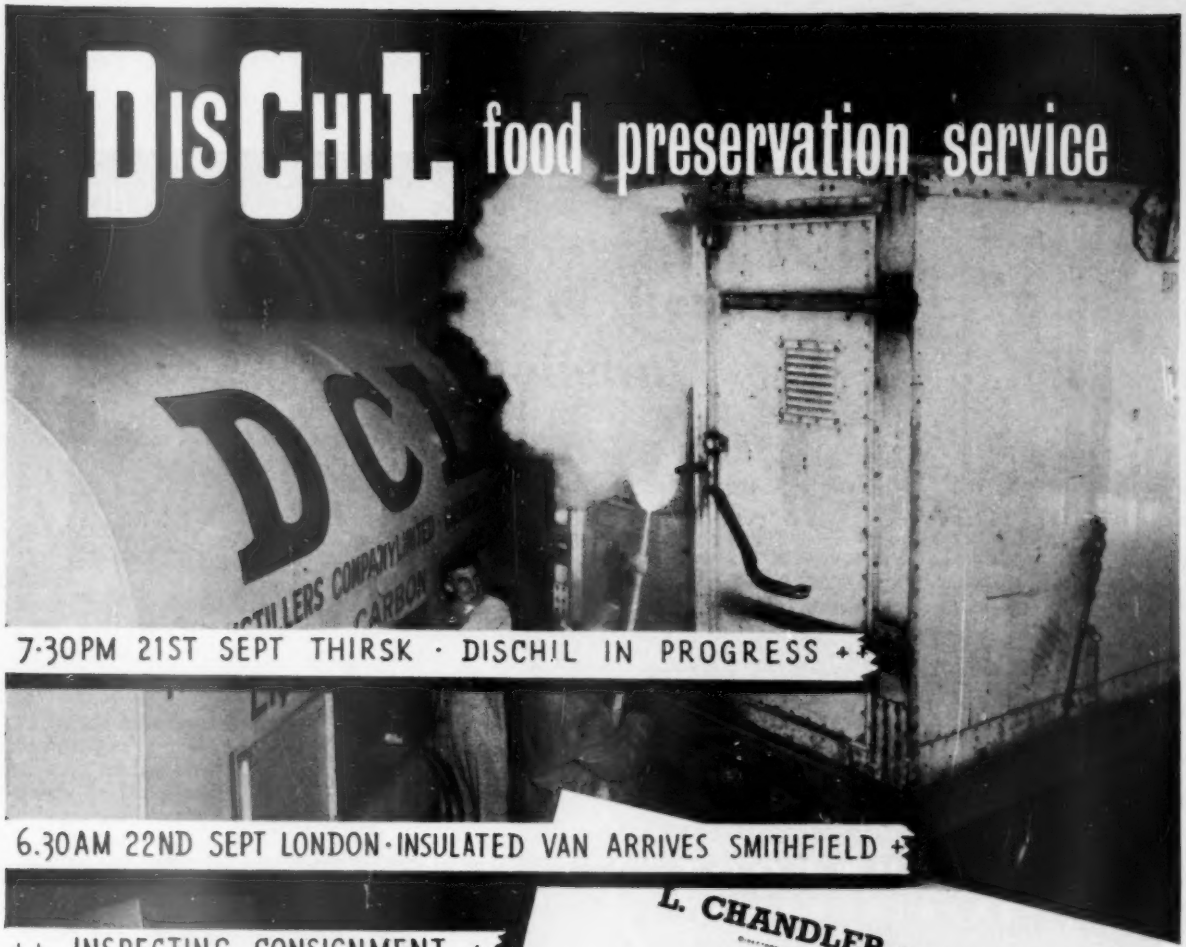
Impressive items in Brand's 1960 development programme are the addition of a first-floor showroom, which, with the existing ground-floor display, will bring the total showroom floor area up to 4,500 sq. ft., devoted solely to refrigerators and refrigerating equipment, a new suite of five offices and the establishment of a new workshop and stores, all of which are scheduled for completion by March.

Arthur Brand Refrigeration Ltd. is an associated company of Gardiner, Sons and Co. Ltd., of Bristol, a firm established more than 130 years. In fact, the Gardiner family have been merchants in Bristol for hundreds of years ; they can be traced back in direct line to a John Gardiner, warden of the Merchant Venturers in 1626, but even before this one Gardiner was said to have helped fit out a ship for a Cabot. On observing Mr. Arthur Brand and Mr. Ben Gardiner together at a staff gathering recently, one could not but help think of the traditions behind these two names, and what they must have entailed in terms of integrity and service through the years. Arthur Brand Refrigeration Ltd. has an ancestral association which should serve them well.

* * *

GARDINER, SONS & CO. LTD. have announced the formation of the following new subsidiary companies, with effect from January 1, 1960. GARDINER REFRIGERATION HOLDINGS (WESTERN) LIMITED—to co-ordinate and control the activities of all the group's refrigeration subsidiary companies, including: GARDINER REFRIGERATION (BRISTOL) LIMITED, a new company formed on January 1, 1960, to take over the activities of the parent company's refrigeration departments at Bristol and Cheltenham; THE SOMERSET REFRIGERATION COMPANY LIMITED, Taunton, acquired by Gardiner, Sons & Co. Ltd. in 1956; ARTHUR BRAND REFRIGERATION LIMITED, Plymouth, acquired by Gardiner, Sons & Co. Ltd. on October 1, 1959. With effect from January 1, 1960, the directors of these companies will be as follows:—*Gardiner Refrigeration Holdings (Western) Ltd.*—Mr. E. B. Gardiner, Mr. J. F. Compton, A.C.A., Mr. A. J. Walters, Mr. R. T. Davies, Mr. J. A. Collins, Mr. E. W. Harrison, A.M.INST.R. *Gardiner Refrigeration (Bristol) Ltd.*—Mr. E. B. Gardiner, Mr. A. J. Walters. *The Somerset Refrigeration Company Limited*—Mr. E. B. Gardiner, Mr. J. A. Collins. *Arthur Brand Refrigeration Ltd.*—Mr. E. B. Gardiner, Mr. J. F. Compton, A.C.A., Mr. E. W. Harrison, A.M.INST.R. Mr. R. W. Trebilcock. Mr. C. J. Mahoney, A.C.I.S., secretary of Gardiner, Sons & Co. Ltd., will be the secretary of these companies.

DisChiL food preservation service



++ INSPECTING CONSIGNMENT ++

L. CHANDLER (Smithfield) LTD.

Poultry and Game Dealers

317/318 CENTRAL MARKETS
LONDON, E.C.1

The Distillers Company Ltd
Chemical Division,
Carbon Dioxide Department,
Queen's House,
Queen's Gate,
Manchester

24th. September 1959.

Dear Sirs,

We are writing in order to put on record our very favourable comments regarding the condition of Poultry received here from Yorkshire last Wednesday morning, having been transported in an insulated container that had been 'Blast Chilled' by your new process. Not only did the Poultry arrive with the exceptionally satisfactory internal temperature of 40 degrees F., but that which was not sold the same day had still retained it's 'bloom' on the following day.

Once again we wish to express our great satisfaction at this new means of chilling transport and hope that the same method will soon be employed by all long distance carriers.

Yours sincerely,

J. Chandler

p.p. L. Chandler (Smithfield) Ltd.

For further details of the DisChiL Food Preservation Service write to:

THE DISTILLERS COMPANY LIMITED CHEMICAL DIVISION

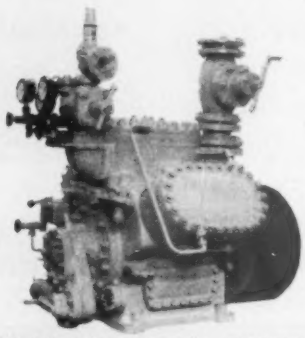
Carbon Dioxide Dept. Devonshire House, Piccadilly, London, W.1.
Telephone: MAYfair 8867.
Depots and branches throughout the U.K.

INDUCED DRAUGHT
'FREON' CONDENSER

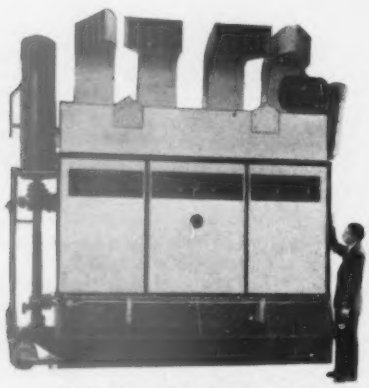
THE COMMERCIAL AND INDUSTRIAL REFRIGERATION EXHIBITION, 1960

Do not forget to visit our stands

LIGHTFOOT
REFRIGERATION



MODEL A.56 AMMONIA COMPRESSOR



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For :
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or "Freon"
Compressors
Condensers
Coolers
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For all purposes :
Air Conditioning
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THE LIGHTFOOT REFRIGERATION CO. LTD., Abbeydale Road, Wembley, Middx. Tel.: PERivale 3322

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694)

FEBRUARY MEETING

AT the meeting of the Institute to be held on Thursday, February 4, 1960, at 5.30 p.m. at the Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London, E.C.3. Mr. J. M. Buist, B.SC., associate member, and Mr. R. Hurd, B.SC., will present a paper, entitled " Polyurethane foams : their contribution to heat insulation."

The preparation and properties of polyisocyanates are briefly described and mention is made of the difference between the volatility and toxicity of the commercially available polyisocyanates. The reactions leading to the formation of polyurethane foams by the mixing of a liquid resin and polyisocyanate are summarized.

Polyurethane foams can be prepared *in situ* by pouring the mixed liquids into the cavity to be filled. The excellent adhesion of the foams to wood and metals makes possible the preparation of high strength to low weight structures.

In the present paper, data is presented showing that with certain polyisocyanates foams can be made *in situ* without involving any substantial toxicity hazard. The toxicity of the pyrolysis products from polyurethanes is also shown to be no greater than that of other commonly used insulating materials.

Substantial advances in the development of cheap portable foam dispensing machines are reported and the experience gained in field trials and applications to marine, land store and chemical plant insulation are discussed. Some of the techniques evolved for filling cavities such as bulkheads and deck heads are described and information is given on the efficiency of insulation obtained in these tests.

An account is given of the high speed of application of insulation using the *in situ* foaming technique.

Semi-flexible foams have been made, also materials possessing superior flow, strength, hydrolytic stability and resistance to water vapour transmission. When applied *in situ* against steel, polyurethane foams are shown to constitute an anti-corrosion barrier equivalent to that of many commonly used primers. The foams are also good heat barriers when used in laminates and it is shown that their contribution to fire when used as an internal lining is not markedly greater than that of plasterboard.

Data on the acoustic properties of rigid and flexible polyurethane foams are given.

The development of new chemicals and equipment to give a satisfactory application of foam by a two-feed spray process is reported, and data on the properties of sprayed foam are included.

The paper will be supported by a film demonstrating the use of foam dispensing and spraying machines in the insulation of some typical structures.

Membership

At the meeting of members held on December 3, 1959, the following were elected to membership of the Institute :—

Member

*Nicol, William, 659/667 Pollokshaws Road, Glasgow, S.1.

* Transfer from Associate Member.

Associate Members

Bennett, John, 59 Bedford Street, Iffley Road, Oxford.

Buist, Jack Mitchell, 8 Barcheston Road, Cheadle, Cheshire.

Dixon, Edward Fairless, Flat No. 1, 80 The Peak, Hong Kong.

Flin, William John, 11 Trafalgar Avenue, London, S.E.15.

*Roberts, Alun James, Windsong, Park Grove, Chalfont St. Giles, Bucks.

Saltrese, George, 84 Grosvenor Road, Maghull, Lancs.

*Skuce, Derrick Edward, 8 Palmers Way, Cheshunt, Herts.

Symons, Hugh William, 14 Queen's Gate Terrace, London, S.W.7.

*Townsend, Gordon, 59 Long Lane, Finchley, London, N.3.

* Transfer from Graduate.

Companion

Robertson, Alexander, Transport Development Group Ltd., Bucklersbury House, Queen Victoria Street, London, E.C.4.

Associates

Caston, Donald Forbes, 21 Clieveden Road, Thorpe Bay, Essex.

Graham, John Ronald, 20 Wolseley Gardens, Jesmond, Newcastle upon Tyne, 2.

Hughes, Charles Bligny James, c/o Messrs. A. J. Gorham Ltd., Hamilton, Bermuda.

Johnson, Joseph Leslie, Kuwait Oil Company, B/F. 5/58, Ahmadi, Kuwait, Arabia.
Jones, Francis Sholto, c/o Luke Thomas & Co. Ltd., Steamer Point, Aden Colony.
McElnay, James C., Greater Niagara General Hospital, Portage Road, Niagara Falls, Ontario, Canada.
*Seppings, Alwyn Henry, 46 Thomson Drive, South Street, Crewkerne, Somerset.

* Transfer from Graduate.

Graduates

Black, David, 39 Brookfield Crescent, Mill Hill, London, N.W.7.
Dickson, Robert J., 71 Croftcroighn Road, Ruchazie, Glasgow, E.3.
Goodman, Bernard Valantine, 64 Francis Gardens, Peterborough, Northants.
Seow, Rodney Kok Ming, 11 Grosvenor Lodge, 94 Grosvenor Road, London, S.W.1.
Wraight, Jim, 66 Leonard Avenue, Swanscombe, Kent.

REFRIGERATION IN THE MEAT TRADE

SPEAKING before The Institute last month, Mr. F. R. I. Gerrard, M.B.E. in a paper entitled "The use of refrigeration in butchers' shops," pointed out that the main objectives in the use of refrigeration was to retard deterioration ; to improve certain types of meat by suitable hanging ; to prevent excessive loss of weight ; to reduce or obviate trimming ; to extend the marketable life of the commodities ; to make more economical use of labour ; and to obtain publicity from hygienic storage.

After detailing these aspects of refrigeration Mr. Gerrard drew attention to some common faults in practical everyday operation. These he listed as follows :

(1) Doors—these are frequently left open unnecessarily, very often with the fans still running. The old stable type of door had much to recommend it.

(2) Defrosting—where this is carried out manually, there is too often a tendency to defer this job with consequent drop in efficiency. Where automatic defrosting is fitted, one may tend to defer the periodical cleaning which was normally carried out (without choice) following manual defrosting.

(3) Overloading—frequently insufficient attention is given to the distribution of meat in the refrigerator and consequently the distribution of air is poor.

(4) Where poultry is stored, contamination of other products, in some cases from faecal material, can readily occur.

Some simple form of humidity control and a suitable instrument of measuring it; the provision of a variable-speed fan ; a simple and cheap form of cold air curtain ; and the prevention of fading of meat in display cabinets, Mr. Gerrard thought should become reality.

At the same sessional meeting Mr. John A. Stonebanks read another paper entitled " Refrigerators and plant." He pointed out that in the design of a good refrigerator, hygiene shared an equal place with refrigeration—one was not acceptable without the other. " All internal spaces and surfaces must be accessible for cleaning and all surface finishes must be durable. Construction must be suitable for the varying conditions of temperatures, vapour pressure, etc.," he said.

" The refrigeration plant must be selected to produce the correct temperature and at the same time a satisfactory humidity condition, the plant must be economical both from the standpoint of space occupied and of performance. Finally, it must be installed in a position where it can be serviced without inconvenience to the user and his customers. The refrigerator must be so positioned that it can be kept clean and in an hygienic condition. Dust, dirt and insects create an ever-present problem particularly with all forms of open-type display units, and special attention must be given to their design and construction," added Mr. Stonebanks.

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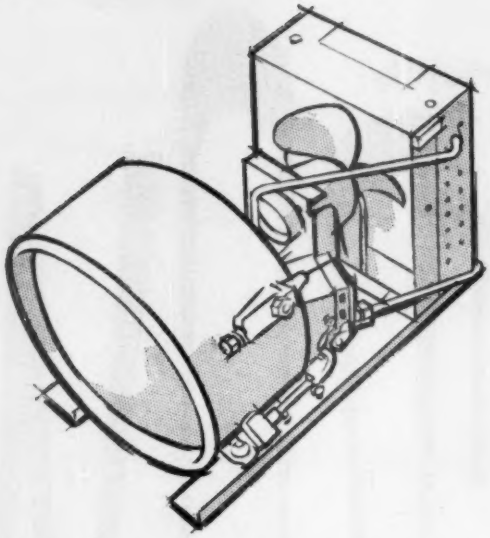

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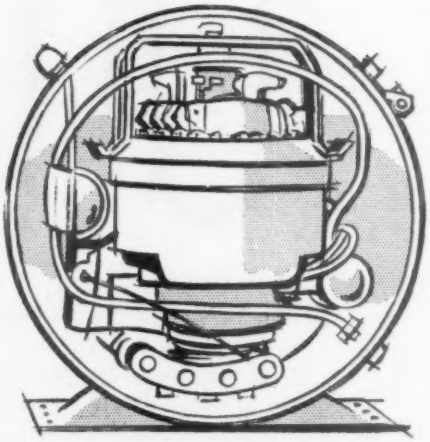

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SHOP REFRIGERATION NEWS

Designed for Delicacies

By OUR RETAIL CORRESPONDENT

WHAT a refreshing change it was last month to visit a magnificent food store that, although certainly super—because in beauty of design it exceeds anything of its kind—does not have to be described as a supermarket. Schmidt's in Charlotte Street is right out of this present world of self-service retailing. It is a large *counter*-equipped shop wherein gourmets from all parts of Great Britain can browse over exquisite confections and rare delicacies or a housewife from a flat round the corner can quickly buy a pound of liver sausage or some fine, sliced salami of German, Danish, Hungarian, or Italian origin.

The emphasis is on counter. Although most effective use is made here of refrigerated display, the term cabinet does not appear to fit the essentially over-the-counter conditions of selling. Every refrigerated case is, in fact, also a counter. But not every counter, nor, indeed, every section of counter, is refrigerated. At a glance there is no difference between those that are and those that are not.

Explanation of this avoidance of contrast lies in the fact that, against the general practice in this country, the whole of the interior equipment—shopfitting, lighting, and refrigeration alike—was made and installed by one firm, Robert Wahl Kon. Ges. of Balingen, Wurtt., Germany, under the direction of a German architect, George Olivier. But Wahl's are also makers of many different types of refrigerated equipment including display cabinets for which J. P. Page & Co., Ltd., 42, Theobald's Road, London, W.C.1., are the British distributors.

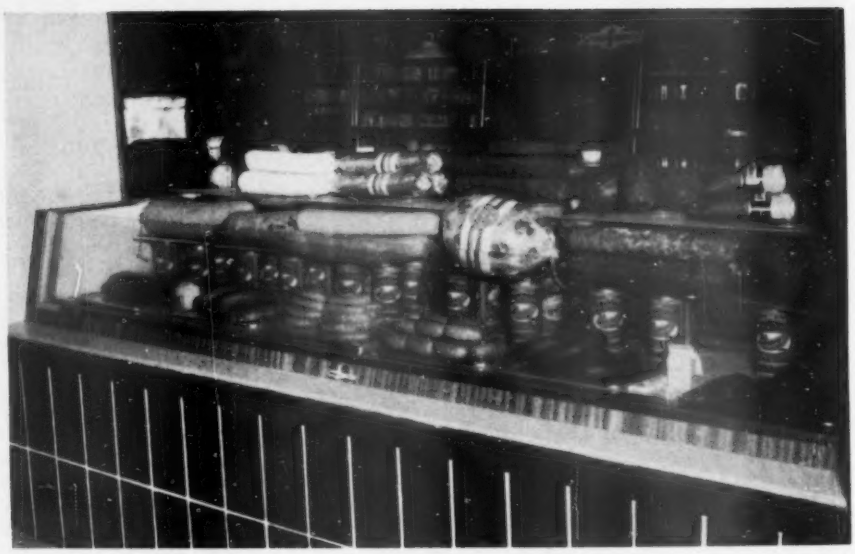
One of the windows is refrigerated. This is 8 ft. long and, in contrast to the other windows, which are backed by a grille of gold anodized aluminium, has a low riser at the back providing housing for the coils. This window shares a compressor with the 6-ft. long refrigerated section of counter for cakes and flour confectionery which forms part of an 18-ft.-long run on the right-hand side of the shop.

The longest continuous run of counter is 45 ft., 34 ft. of which is refrigerated. This includes the section in the sausage department (24 ft.) at the back and curving round to continue in a short length on the left-hand side. There is then a non-refrigerated run of 11 ft. This counter terminates with a 10-ft. refrigerated run for salads which customers find on their left on entering.

All the counters that are under controlled temperature (3° C.) are refrigerated by coils at the back, in

conjunction with operating machinery in the basement. This comprises, in addition to the compressor already mentioned, one for the sausage department and one for the salads. Two other compressors await the installation of refrigerated features in the adjoining restaurant.

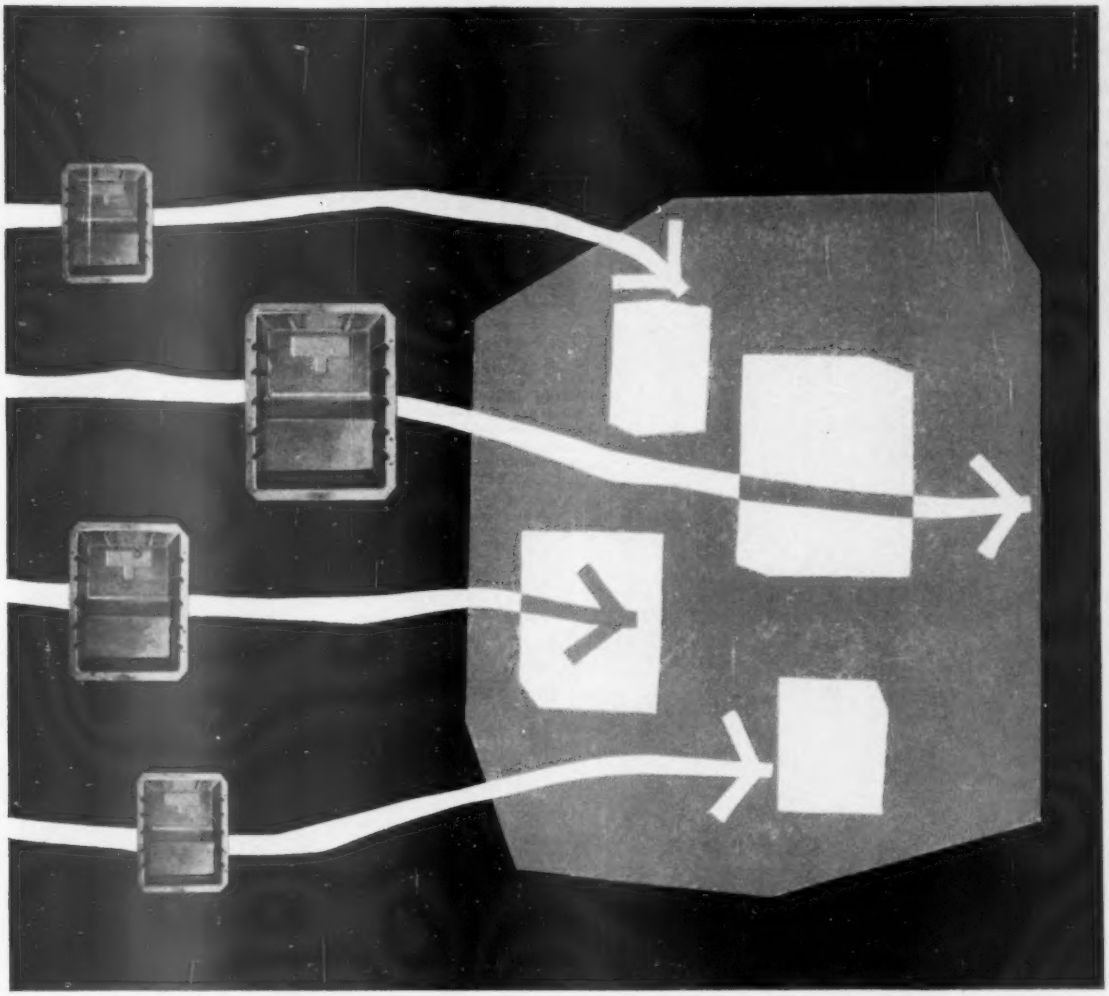
Exquisite confections, for which Schmidt's are justly famous, are here displayed.



The delicatessen counter. Schmidt's do a large business in the products shown.

B.R.A. LUNCHEON

The British Refrigeration Association are making arrangements for the annual luncheon to take place on Friday, March 25, 1960, at the Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2. The Right Hon. Reginald Maudling, M.P., president of the Board of Trade, has accepted an invitation to attend. It is anticipated that the chairman of the Association, Mr. John A. Howie (managing director, The Lightfoot Refrigeration Co. Ltd.), will preside.



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13 million refrigerator liners are required before Britain enjoys the same standard of domestic refrigeration as America.

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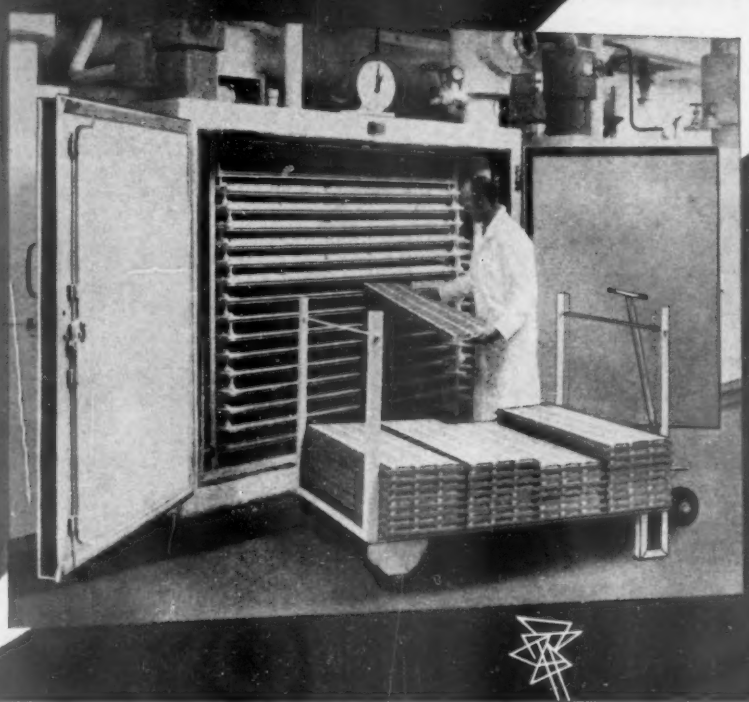

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HUSSMANN'S 1960 RANGE

HUSSMANN British Refrigeration Ltd., recently had on display at their Tottenham Court Road, London, headquarters their 1960 range of food display cases. Two new developments in this series deserve special mention :—

Model D. Cascade Four-deck dairy case

This is a new development of the very well-known Hussmann three-tier Cascade model for the wide open display in self-service shops and supermarkets of all types of dairy goods, pre-packed provisions, or pre-packed fruit and vegetables. Pre-packed cooked meats, pies, etc., as well as wrapped or unwrapped poultry and game can equally well be displayed and sold faster as " impulse " sales items in all types of retail food outlets. These cabinets operate in the temperature range 38/42° F. and the good refrigeration reserve and research work on the three-deck model has now enabled Hussmann's to introduce yet another, fourth refrigerated display shelf 12 in. wide which gives *additional* vertical display areas of :

6 ft. model	...	6 sq. ft.
8 ft. model	...	8 sq. ft.
12 ft. model	...	12 sq. ft.

This is the first standard four-shelf Cascade model introduced to British buyers as standard equipment. These four shelf models are listed only fractionally above the price of the standard three-deck model.

Model D Cascade 6 MT (meat) vertical display case.

This is yet another new version of the Cascade range at present only available in 6 ft. lengths, but expected to be available in standard 8 ft. and 12 ft. lengths in a few months. Like all Hussmann Cascade and MD range mass display cabinets, the design is such that this model can be multiplexed (with end panels removed) with other models of the same type to form continuous mixed display runs, featuring, for instance, a dairy section joined to a meat section so that the shopper with her basket has an easy and logical movement from one perishable food section in the store to another as she purchases goods with her mid-week or week-end requirements in mind. Hussmann have designed this cabinet for pre-packed meats and poultry, where stringent temperature control conditions are required for pre-packed meats, and yet, at the same time, the wide open vertical Cascade method was demanded by the trade. The technical problems involved in the design of such equipment were very considerable. Supermarket operators

who visited the display last month were full of praise for this much needed development, and were impressed by the condition of the English frozen and chilled meats displayed in this cabinet. Phillips warm white deluxe lighting (double-coated) tubes give the whole cabinet a bright and attractive appearance, but most important the natural meat colouring is faithfully interpreted. This model is fitted with a 1½ h.p. remote hermetic condensing unit with a 1 year guarantee.

NEW DEPOT FOR TESCO STORES

A NEW head office and central warehouse have been built for Tesco Stores Ltd., at Cheshunt, in Hertfordshire. Incorporated in it are large butter and cheese stores.

Determined to make this warehouse as efficient as any in the country, Tesco engaged a firm of industrial consultants to advise on the layout and planning. Their prime task was to eliminate manhandling.

Fork-lift trucks, therefore, had to be used capable of carrying goods between the vehicle bays and the coldrooms—that is to say, not just to the outside of the coldrooms, but right inside to their final position. German fork-lift trucks have been bought. Among a number of special features is their ability to turn round almost within their own width. As the trucks will be used in the cold stores, this will reduce the size of the gangways, thus increasing the amount of food stored.

The doors to the coldrooms had to be 9 ft. high to give the trucks a 1 ft. clearance and special attention had to be given to the best form of racking. Tubular racks were designed for Tesco's pallets.

The butter store was designed to cool and hold 24 tons of butter a day at 40° F. Turn-round is quick, normally no longer than two days, and therefore a total storage capacity of 56 tons is sufficient. This meant a coldroom of about 26,000 c.ft.

Refrigeration is by two Frigidaire WD6BS-500 water-cooled condensing units in conjunction with two SFF-106D floor-mounted forced air evaporators. Each condensing unit is coupled to one evaporator.

Cheese is stored in an 8,500 c.ft. coldroom at 47° F. The quantity of cheese coming in each day is much less than that of butter, being about two tons. However, turn-round is not as quick, so a store was required with a total capacity of 10 tons.

This room is cooled by one WD6-300 water-cooled condensing unit together with three SCF-900 forced air evaporators.

Due to the necessity of economizing with water, an aquatower has been installed. This is situated inside the warehouse, but with the fan discharging to the outside atmosphere.

Both stores have been built on the semi-built-in principle. The ceiling has been fixed to the warehouse roof, but the sides are free-standing. The interiors have been finished in Galvatite and so have the exteriors to a height of 4 ft. Above that are tongued and grooved boards with white enamel surfaces.

That is the equipment recently installed by Brett Daniels Ltd. for Tesco at their warehouse. But Brett Daniels Ltd. are also engaged in a great deal of other business with Tesco.

Tesco have altogether about 150 shops and in the past year Brett Daniels Ltd. have assisted in the conversion of about 20 of them to self-service. Under construction now are four new supermarkets, which will open at Hatfield, Staines, Maidenhead and Maidstone. For these shops, Brett Daniels Ltd. are supplying no less than 14 coldrooms and over 200 ft. of Manhattan display cases.

Their expansion will not stop there. Already a further five supermarkets are being planned, each with about 4,000 sq. ft. of shop area. Dunstable, Portsmouth, Colchester, Waltham Cross and Rickmansworth are the places on this list.

One of the most significant points in the organization of their new warehouse is the very rapid turn-round in goods, butter, for instance, in about two days. And yet it is refrigerated.

CARLO GATTI'S STORE EXTENDED

United Carlo Gatti, Stevenson and Slaters Ltd. of Battersea, London, have recently built and put into commission an additional 30,000 c.ft. of storage space at their Parkgate Road headquarters. This extra capacity comprises one independent chamber of the above size for frozen foods and it is estimated that 250 tons can be accommodated. The temperatures range available readings as low as – 20° F.

The new chamber is insulated with 6-in. polystyrene on the floor and walls and with 8-in. on the ceiling.

The automatic refrigeration plant includes two Grasso 2-cyl. compound ammonia compressors, type AV, an auto-starter and a forced draught condenser. The plant was supplied and installed by G. Williams Engineering Co. Ltd., while the insulation and construction was carried out by T. W. Weeks & Co. Ltd., of Battersea.

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A housewife's viewpoint on HOME-FREEZING

By Mrs. J. A. FORRESTER

SINCE there has been a rapid growth in the domestic use of frozen foods and in interest in the possibilities of "deep freeze" in the home, I think that the industries concerned may benefit from the experience, and the views, of a consumer and experimenter.

I am a housewife with 27 years' experience of refrigerators, nearly half of that time being spent in India where the cold storage of food is essential, yet I have only recently realized how much better service I could have received if I had known of the possibilities open to me. This waste of years I lay at the door of the industry because of the lack of spontaneous offers of helpful information and of the difficulties placed in the way of the beginner.

Nearly three years ago, after my return from India, I wanted information about deep-freeze technique and equipment; I needed full details of performance and capabilities of equipment of which I had had no direct experience. But in all the shops and stores where I enquired I was given only small leaflets that gave specifications of size of cabinet, motor type, cooling system used, and so on, but virtually nothing about what I could do with the equipment in the home. The domestic user wishes to know what range of foods can be frozen, how long different items can be safely stored, something about the economics of the system, and so on, not about the motor housing.

I asked for the details I wanted; the reply was: "Buy the machine and you will get a book of instructions with it." It is asking rather much to expect a hesitant buyer to pay more than a £100 for an article in order to get the very information he or she needs in order to decide whether to buy the article.

The prospective purchaser is further shaken by the attitude of the larger organizations. When I asked one electricity board for particulars of deep freezers I was told that the board would not consider stocking them until there was sufficient demand, and that I should try one of the "stores"—a strange reply from a nationalized industry, and one that might well have put me off for good, assuming that if an electricity board will have no dealings in such equipment it is presumably not up to the standards required by official bodies, or still merely in the experimental stage. One firm could give me advice and information at their "London address" but as the address was not given in the leaflet the service remained a mystery.

Fortunately, I was able to read "Refrigeration Principles and Practice" (ed. Griffiths) and also to obtain through a friend in the States the less formal but more immediately useful book "Into the Freezer and Out." This latter book may have been available then in this country, but if so I was unable to run it to earth.*

In order to compare the attitude of three years ago with that of to-day, I visited four large London stores a few days ago, asking them to show me deep-freezers and to give me information about them. Here are the replies:—

Shop No. 1: had one deep freezer among the other electrical equipment, but they could give me no information other than that contained in a small leaflet I had met before.

Shop No. 2: had a similar leaflet and could get a unit for me, but had none in stock.

Shop No. 3: had one freezer, but no leaflet nor any other information.

Shop No. 4: had a freezer and a leaflet. On being pressed for further information the salesman told me that more could be obtained from another branch; but the leaflet did not say so.

So much for the larger shops and stores; the smaller ones reach even lower levels, as exemplified by a dealer in Epsom who helpfully said: "You tell me who makes the freezers and I'll get the information for you." And there are others who think that it is refrigerators that are being enquired about. Presumably they hardly know what deep-freezing is.

Even when the freezer has been bought, there are still troubles in store for the user. The home user cannot buy aluminium containers for the cooked meat and other preparations that are sold in their foil containers. I have tried all the larger stores in London and personally gone to three leading makers. If, as it appears, there are reasons for not making such articles available to the general public, they could surely be included in kits and sold in the large stores.

I had similar trouble in finding where I could get information about heat-sealing and about sealing irons, and succeeded only after a visit to the Printing, Packaging and Allied Trades Research Association at Leatherhead, where I learnt that I could get what I wanted at Surbiton and at Manchester Square. The heat-sealed "Cellophane" was extremely difficult to trace, and there are no firms that I know of that will sell necessary polythene in reasonably small quantities. And I have met with many other similar difficulties. I am constrained to ask: "What is the point of selling deep-freeze equipment if it remains next to impossible to run it efficiently?"

The sum total of my experience seems to suggest a lack of enterprise and of imagination on the part of the industry. New ideas reach the market for no very apparent reason. In the *Daily Telegraph* of October 13, 1957, there was an article "In the Bag," by Egon Royan, describing the idea of a meal in a bag, then available and flourishing in America, a meal that could be warmed up in 12 minutes. It was claimed that one of Britain's biggest caterers would have this on the market in a few months. I did not notice any of these food bags at the recent Frozen Foods Exhibition, though the September issue of *Frozen Foods* says that a leading caterer has developed a unique pack that takes only 15 minutes to heat up. Perhaps by the time another two years have gone by we shall see on the market frozen-food packs that will take only 18 minutes to heat up. I was also somewhat disappointed at seeing so few really new frozen foods on show at the exhibition. I have myself successfully experimented on many interesting cooked and uncooked foods during the past two years or so.

People in the frozen-food industry should listen to conversations and remarks between housewives around the freezers in the food stores. Much greater variety and more seasonable changes could be arranged. And just in case the same branch of the industry may fear a falling off in sales through increasing use of deep freeze in the home, I may say that although I practise deep freeze in most of its branches I also buy much frozen food, partly for immediate use but much of it for storing for later use.

I know that I am not alone in experiencing these difficulties when trying to develop the use of this profitable technique. There may be many throughout the country who have felt like giving up the struggle either from frustration or from lack of time. I have not given up the struggle and I know my explorations in this field have been worth while. I am quite prepared to meet any influential people in the industry who may be really interested, and discuss further my ideas.

*This book has always been obtainable from Refrigeration Press!—*Ed.*

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REFRIGERATION IN INDIA AND I

BY M. L. KHANNA, B.Sc. in E.E., C.E.E., MEM: ASHRAE, M.INST.R., M.R.S.H.

Although the present export situation for British refrigeration products in India is difficult owing to the latter Government's planning control, the author of this article, who was responsible for choosing much British plant during the building there of cold stores immediately after the war, is convinced that there is a big future for our machinery when the exchange position becomes easier.

M. L. Khanna.

BORN just over 55 years ago in a small town, now in West Pakistan, I was brought up in the State of Kashmir as my father was employed by the Maharaja. As far back as I can remember, during the days when I was 8 or 9 years old, I began to wonder why there was so much wastage of so many things, particularly eatables, in our own home and in the homes of many friends and relatives, including spoilage in the storage and in the transport of the rich produce of that beautiful State which many authors and travellers have called the Switzerland of Asia.

In the far north of Kashmir, not knowing that baraf peti (ice refrigerator) had already come to India, I began to fool about as it were with snow from the Himalayan ranges that used to be sold in the markets of Srinagar, the summer capital of the Maharaja. Visiting one of the apple gardens as a youngster, I saw the ice pits in which Kashmir farmers kept their fruit produce fresh. As I grew older, I asked my father how this wastage in items of food could be saved? His answer was indeed very noble and it appears that he felt keenly that the question was most penetrating and said, "Do not leave anything on your plate and do not let your friends do it either; thus, you could help save food," and I remember his remark further when he said, "In our country, my son, millions do not eat a square meal a day; to waste food therefore, is almost a crime." I began from then on to feel most eagerly that their ought to be some solution to this problem.

Matriculating in 1922 much against the wishes of the "well-wishers" of my family, I went to that great city Jamshedpur where the famous Tata steel works are located. I wanted to become an engineer to see whether there was some method by which science could assist from what I thought ailed India most. In Jamshedpur, as an apprentice under training in the heat from the huge blast furnaces apart from the usual hot weather in summer, I began to think that there could be some way where comfort, yes, artificial comfort could come, keeping in view the electrically driven fan.

Coming across some British and American engineers employed at Tata's, I managed to leave India and went straight to the United States via England. For nearly eight years I struggled hard to win my bachelor of science degree in electrical engineering and finally, as luck would have it, my dream came true. I graduated in 1934 and Professor Oscar Werwath, a great Wisconsin educator, recommended me to Mr. Vilter of that famous Vilter Manufacturing Co. of Milwaukee, manufacturers of refrigeration plant and machinery, where I was accepted for a post-graduate course of more than two years. I was to specialize, said Professor Werwath, in refrigerating engineering and he repeated, among many things, the words of my father who was long since dead: "Your worst enemy out in India is famine and refrigeration will help to solve that problem." Mr. Vilter had me trained in all the departments and, finally, I was sent back to India in 1936 after an absence of almost 10 years abroad.

By the time I arrived back, ice plants had come into being and some of them had been there quite a time. I noticed that ice was being used for keeping cool meats, fish, milk and other produce. I remember having introduced a number of Vilter ice plants in the Punjab area, a part of which is now embraced by Pakistan. Some of my countrymen were also in the field then and they too trained both in the U.S.A. and the U.K. Here I must mention the name of the late Mr. R. G. Trusler, a pioneer in refrigeration in India, whose early work we must all look up to with gratitude.

The war came in 1939 and after about two years the services of Indian technicians were called for by the Government and I was given charge of seasoning timber, which work I thoroughly enjoyed because it was a matter of installing seasoning kilns and I fitted in well with the engineering involved, having spent some time on a refresher course with the Forest Research Institute at Dehra Dun.

Government of India work

Very soon thereafter, I was asked to dehydrate food and in 1944 the Government of India through the Department of Food, decided that I should be sent to the U.K. and U.S.A., along with a well-known Indian scientist to study afresh subjects such as dehydration, canning, packing, refrigeration, refrigerated transport, etc. Reaching London around the month of September, I found activity the like of which I had never seen in my life before—heavy bombing and yet, everything continued. We visited industries, research laboratories, educational institutions and indeed, the Low Temperature Research Station at Cambridge where in actual fact, I felt at home, more than any other place, seeing work done which was after my own heart.

In December the same year we were switched over to the U.S.A., and there the industrial might to fight the war was in full swing. We returned to India in March 1945, and I remember the remark I made to some of my colleagues of the then Government in the Department of Food. "The war should be over in about six months from what I have seen of the preparation both in the United Kingdom and the U.S.A. Of all methods that I have studied for peace-time India, canning and refrigeration will provide the solution to meet shortages of food—refrigeration more especially since it will quicken scientifically the processes of manufacture, bringing at the same time, comfort conditions in our industries, both small and big."

The Government of India published our tour notes from which I mention some of the important recommendations we made:—

Both in London and in Washington, D.C., some of the advanced countries like the U.K., the U.S.S.R., Australia, France, New Zealand, had scientific liaison officers and we suggested that in a similar manner Indian technicians be

stationed there too. Considering that India, the major part of it at any rate, was a country of very warm climate, we suggested that the planned development be taken into consideration urgently for processing and preservation of perishable foods. Of the different methods that we had seen, we thought that refrigeration was the one which would help preserve most nearly the original quality of perishable foods.

To the critics, and we had many, we gave an assurance that the processes of canning, dehydration and refrigeration were not so much competitive as complementary for we wrote that there would be conditions under which one or the other of the processes would be suitable.

We asked for plants to be installed not only for the staple foods but also for the preservation of fruit and their juices, considering the very rich crop of oranges, mangoes, papaya, etc. As a matter of fact, we stated that such fruit and fruit juices would, indeed, have a market abroad.

We pleaded that packaging required attention.

We spoke at length about fisheries development, asking for the adoption of the quick-freezing technique and here we suggested that fish need not only be quick-frozen but that it could be canned, dry salted, smoked and dehydrated. We suggested the installation of offal disposal plants for meat and fish processing industries and embracing the shark liver oil industry in India.

In 1946 I was transferred to the Department of Agriculture to take on the installation of ice and cold storage plants for the preservation and storage of food and help other departments, both at the centre and in the States, for the work connected therewith.

War was over and private enterprise came forward with much of the money needed, the result being that in a short time ice and cold storage plants sprang up practically in all the principal cities of India, in addition to a smaller number that was already there.

The partition of the country in 1947 brought added difficulties because, among many other things, I was asked to assist refugees, some of whom were employed in this kind of work in their previous surroundings, but had now gone over to Pakistan.

The All-India Refrigeration Development Conference, under the auspices of the Ministry of Agriculture, was held in New Delhi in July 1948 and presenting a small brochure on refrigeration, which I wrote myself with the permission and assistance of the Government, I pleaded for the planned development of this industry.

During two days of meetings, at times in the presence of the Honourable Minister for Food and Agriculture and many high officials of the Government both at the centre and the States along with representatives from trade and industry, many resolutions were accepted, keeping as a guide all along the words of the Honourable Minister who said, "Machinery has value if it can help man without rendering him workless. Refrigeration plants, I hope, will serve that purpose." The conference suggested that growers be asked to take advantage of cold storage plants and that development of refrigeration industry should be left to private enterprise with technical guidance coming both from Government and the experts in the trade.

The conference pleaded that the question of organization of refrigerated transport on an all-India basis be taken up with the railway departments. The conference further recommended that the question of training personnel in India and abroad to run this industry be given priority and that efforts be made to manufacture parts of plant locally. The conference suggested the adoption of standard safety measures in such plants and finally, to set up an advisory committee to advise Government on various problems connected with the industry so that the refrigeration industry could be classified as an established industry.

In 1951 economy in Government expenditure brought about the abolition of many posts, strange as it may seem, including technical ones and, indeed, my position. My pleadings with those who were in power fell on deaf ears. The work had only started and leaving it undone, I thought, would not only hurt me but it would hurt India and besides, I did not know how I could go to the 8th International Congress of Refrigeration which was to be held in London in the same year. Because of World War II the Congress had come after a longer lapse of time than usual, and it was my first opportunity to meet practically all my colleagues from the world over, some of whom I had known many years and to most of whom I owed all that I knew about refrigeration. I picked up enough courage and went. At the congress I presented my paper namely, "The progress in the field of refrigeration in India." The congress, to say the least, was a great success and I believe it was due mainly to the fact that it was backed by His Majesty's Government (Ministry of Food) and that His Majesty the late King George VI most graciously had agreed to be its patron.

To me, as an individual, the congress did added honour when it selected me to speak on behalf of Asia, along with three other scientists-cum-engineers who spoke on behalf of Australia, Africa and America. British industry gave opportunities for any one of us to study any phase of this very vast subject.

After remaining in the U.K. for about six months, I returned to India in February 1952. In all truth, I am now "in cold storage" and I wish to tell the world, at least, the scientific part of it, the story of "Refrigeration in India," the first instalment having been concerned with my background.

(to be continued)

New Companies

(continued from page 48)

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Refrigeration Services (Southampton) Ltd. 35, East Park Terrace, Southampton. Secretary: Emmeline A. Earles. To carry on business of maintainers, repairers and hirers of and dealers in refrigerators and cold storage plant and machinery, etc. Nominal capital £100. Director: Thos. E. Earles, 93, West Hill, Titchfield. Solicitors: Footner, Taylor and Lawrence, Romsey, Hants. Registered by Shaw & Sons, Ltd.

Williams Cold Storage (Thetford) Ltd. Secretary: Joyce E. Waight. Nominal capital: £1,000. Permanent directors: Geo. I. Williams, 77, Eastcote Road, Ruislip, Middlesex; Francis A. Garrett, Redbourn House, Virginia Water, Surrey. Registered by Waight & Co., 179, High Street, Bromley, Kent.

Super Soft Ltd. National Provincial Bank Chambers, Five Ways, Birmingham, 15. Secretary: A. E. Howard. To carry on business of manufacturers of and dealers in refrigerated vehicles for the transportation and/or sale of ice-cream, etc. Nominal capital: £1,000. Directors: Wm. J. Walters, 902, Warwick Road, Acocks Green, Birmingham, 27; Fredk. E. Thirlwell, Greystone, Shadforth, Durham. Registered by H. A. Just & Co. Ltd.

William Douglas & Sons (Engineering) Ltd. Douglas Wharf, Putney, S.W.15. Nominal capital: £100,000. Directors: not named. Subscribers: William S. Douglas & William L. Douglas, Douglas Wharf, S.W.15. Registered by solicitors, Clifford-Turner & Co., 11, Old Jewry, E.C.2.

Barnett & Street Refrigeration Ltd. Lynden, Ganghill, Burpham, Guildford. Secretary: J. T. Kemp. To carry on business of inventors, advertisers, designers, manufacturers of and dealers in refrigerators, etc. Nominal capital: £1,000. Directors: not named. Subscribers: George R. Lonsdale, Threeoaks, Birdshill Road, Oxshott (co. dir).; John D. Williams, Lynden, Ganghill, Burpham, Guildford. Registered by Jordan & Sons, Ltd.

Fridges & Washers Ltd. 2, Grasmere Road, Blackpool. To carry on the business of designers, manufacturers of and dealers in refrigerators, washing machines, etc. Directors: Thomas H. Metcalfe, 22, Norkeed Road, Cleveleys, Blackpool; Derrick Smith, 1, Burwood Drive, Blackpool. Nominal capital: £1,000. Registered by Jordan & Sons Ltd.

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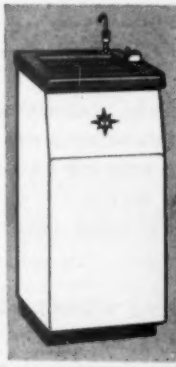

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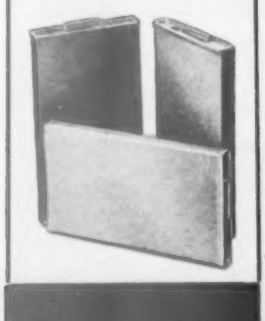

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REFRIGERATION SERVICEMEN'S ASSOCIATION NEWS

DURING the past few months the growth of the R.S.A. has brought a corresponding increase in the duties of the honorary secretary, who not having the time to devote to the additional work has regretfully relinquished this position. Consequently, Mr. L. Steggel has been appointed to this position in place of Mr. M. R. Hadrys who still retains his great interest in the R.S.A. as a member of the h.q. committee. Mr. Hadrys wishes to thank all those both at home and abroad who by their interest in the R.S.A. made his task a pleasure, and their enquiries were fully appreciated and their letters always welcome.

A lecture on insulation has been given by Mr. G. Laing, of Miller Insulation, who with the aid of slides, showed the importance of vapour pressures to be considered with different thicknesses of insulants. The lines of condensation and freezing proved the necessity of an effective vapour barrier when erecting insulation.

Insulation being the means of reducing heat flow, the three forms of heat flow, conduction, convection, and radiation were considered, also the four groups of insulators :—

Granular : examples being granulated cork, vermiculite and charcoal that form pockets of still air.

Cellular : examples being slab cork, expanded rubber, and in the plastic field, slab polystyrene and foamed polyurethane that enclose still air pockets with solid walls.

Fibrous : examples in this case are Fibreglass, glass and slag wool. This type has air films around the fibres to prevent heat transfer by conduction also heat transfer by convection is offset by a high packing density.

Reflective : of which the most common example is aluminium foil used for reflecting radiant heat.

In considering pipe insulation, it was pointed out that in the case of liquids in small bore pipes, thicker insulation is necessary owing to the small quantity of liquid present in the pipe.

The question of low temperature work as discussed involving the use of resilient insulants to compensate for the different co-efficients of expansion between the insulator and the structure itself. As is to be expected, there are high vapour pressure differentials to be taken into account.

This most interesting lecture concluded with the lecturer ably satisfying questioners.

The next lecture concerned the "Application of electrical equipment to refrigeration." Mr. C. Bramzell, of The Lightfoot Refrigeration Co. Ltd., commenced by pointing out that many problems met are of an electrical nature which is not surprising when a large percentage of the equipment on plants is electrical. He stated that to solve many of these problems, a basic knowledge of electricity is needed.

Posing the question—"What types of motors and controls to use—and why," he went on to discuss single-phase motors starting with the shaded pole motor well known in use as a fan motor on sealed systems. While their efficiency and power factor are low, their cheapness and simplicity in manufacture make them suitable for this type of work.

Passing onto split-phase and capacitor start motors in use for units up to 1½ h.p., it was pointed out that unlike the shaded pole motor, the direction of rotation of these types can be reversed. Also their starting torques are higher. In the case of split-phase motors, it is up to 175 per cent. of full load torque as opposed to 150 per cent. in the case of the shaded pole motor. This limits its field of application and it is usually found used with the small sealed systems where the capillary tube provides a means of unloading the system during the off-cycle. Capacitor start type motors having a starting torque of 300/400 per cent. are a popular type of motor being used for both sealed systems and open type units.

A similarity between D.C. motors and the repulsion-induction type was pointed out insomuch that both types have commutators and brushes. However, unlike the D.C. motor, after reaching speed, in many cases centrifugal force lifts off the brush gear and at the same time the commutator is shorted out. In other cases the brushes remain in position but the commutator is shorted out after the motor has reached full load speed.

With three-phase motors, the squirrel cage can be used on plants up to 5 h.p. direct on line. It has a poor starting torque, 175 per cent. full load torque but the next choice is the slip ring motor. The rotor windings are brought out to the slip rings on which rest the brushes that are in turn connected to the starting resistances. On starting, a controller cuts the resistances out in turn as the motor reaches full load speed. Both performance and efficiency are good.

For installations where the motor is coupled direct to the compressor is found the synchronous motor. Where a constant speed is necessary this type of motor is satisfactory.

Slides amply illustrated these types of motors.

To ensure that a motor is working efficiently, it should be the correct motor for that type of installation. For instance, the speaker mentioned that where dust is prevalent, a totally enclosed motor should be used. Efficiency is lost through neglect and cleanliness should be adhered to prevent this loss. The ports of motors should be kept clear to enable the motor to run cool even though motors can run when quite warm. Over-lubrication was an item not to be commended. One item that suffers from neglect was the oil in starter dash pots. The oil level drops and is not noticed until trouble starts.

Looking to the future, the speaker foresaw a trend for greater usage of hermetic units, larger high speed rotary compressors and more efficient and smaller control gear through the use of electronics. This talk together with a lecture on thermo-electricity at the Institute of Refrigeration last winter caused the writer to wonder how far electricity would reach into the refrigeration field.

The December 30 meeting proved to be of great interest to members as it provided them with an opportunity to solve their own particular problems. Instead of the usual lecture a brains trust was held. Answering the questions were Messrs. A. C. Murdoch (chairman), R. V. Steel, G. F. Stedman, and N. J. Rochester.

REFRIGERATION AT POULTRY SHOW

Although there was no Prestcold stand at the Poultry Show last month the company was, nevertheless, well represented. On the stand of the British Egg Marketing Board, the Prestcold "Producer" egg-storage cabinet was prominently displayed. This cabinet was developed by Prestcold in co-operation with the board. A special display of Prestcold "Farmoor" sales and display cases stocked with frozen turkeys appeared on the stand jointly presented by the *Farmer and Stock-breeder* and *Poultry World*.

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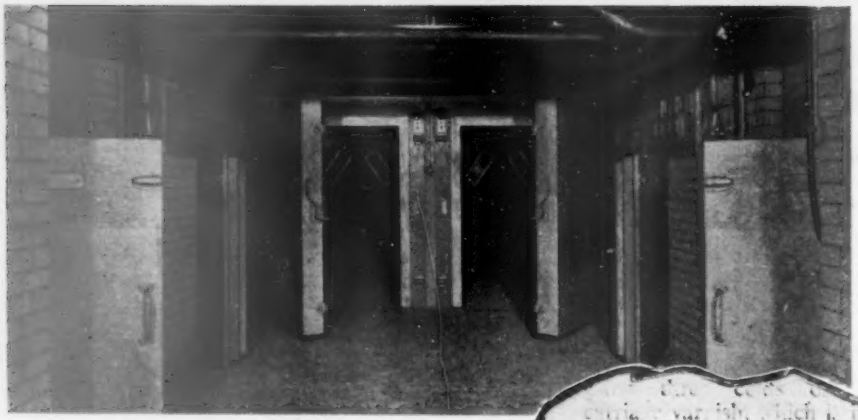

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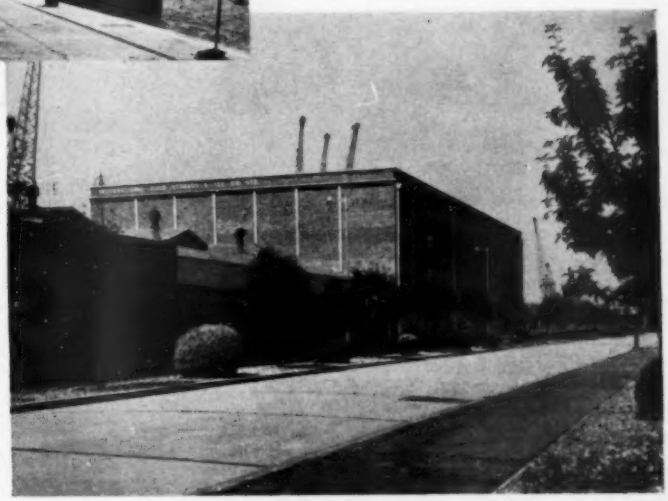

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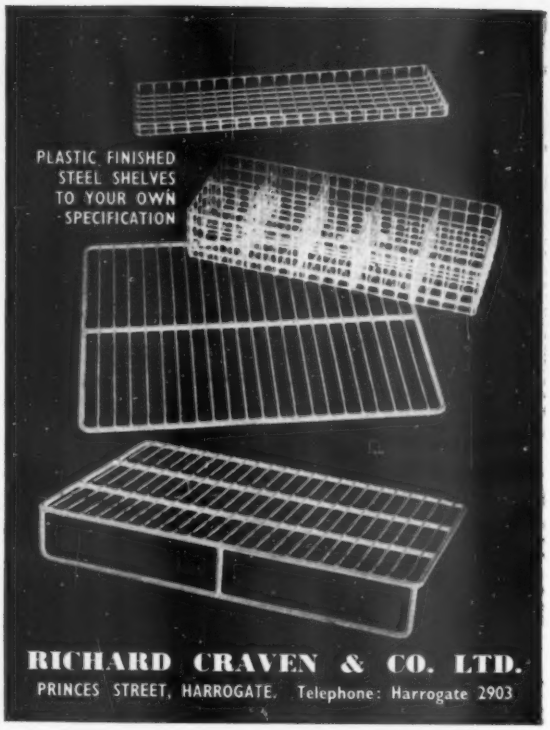

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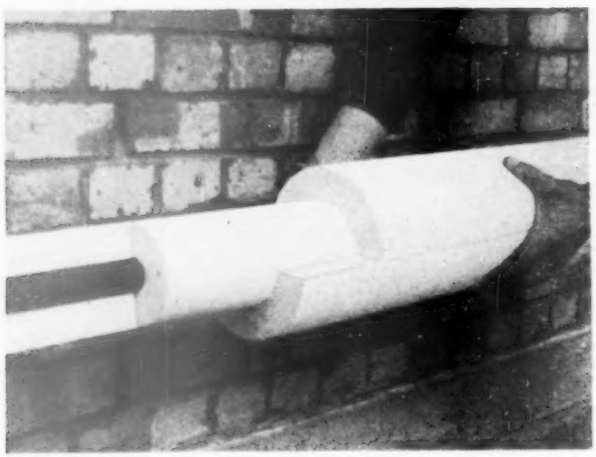

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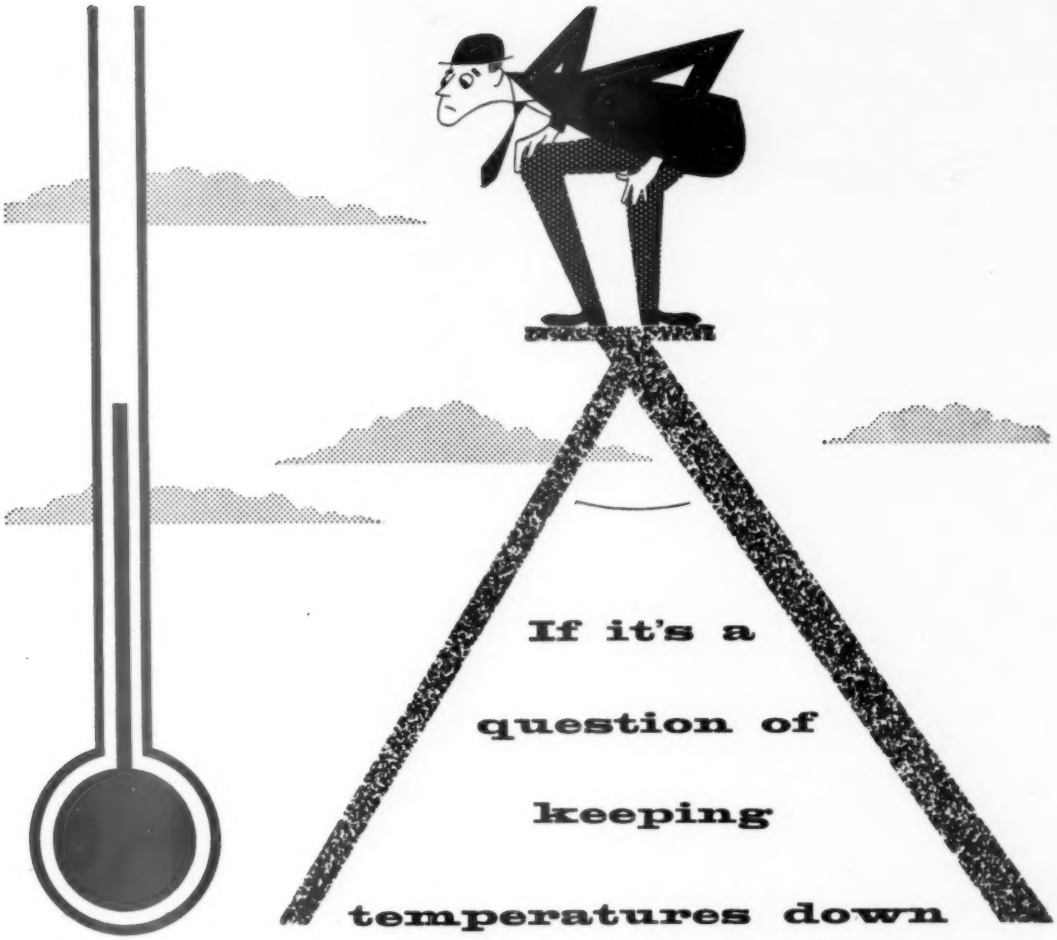

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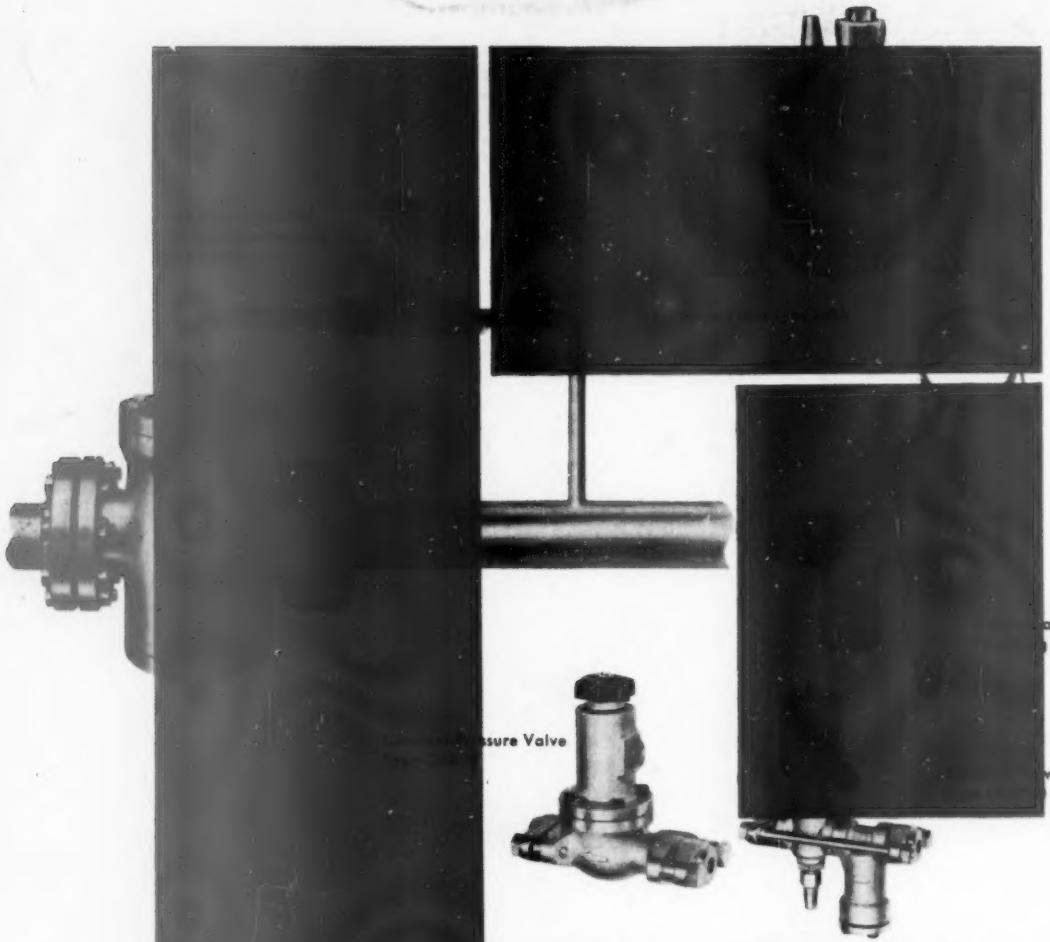

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